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THE OIL WEEKLY

WORLD OIL

SPECIALIZED FOR EXPLORATION, DRILLING,
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AUGUST 1, 1954

Gulf Publishing Company

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See International Section

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WORLD OIL

Established 1916 as The OIL WEEKLY

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August 1, 1954

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a quick look at WORLD OIL THIS MONTH

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☑ those you want to read first.

CURRENT OUTLOOK

☐ **Nevada's in the news** and Shell Oil Company's recently completed discovery well, pumping about 350 barrels of oil per day, appears to be of top importance and significance. Oil from the well is not only the first oil production for Nevada, but also the first for the Great Basin, one of the largest sedimentary basins in the U. S. and covering parts of three states. This month we give you an article that provides comprehensive coverage of significant information about this exceptional discovery. It includes . . . a map showing the big basin in which the strike was made, a cross-section of the formations encountered, and photographs made by WORLD OIL Staffer Gilbert Wilson. There's a discussion of leas-

Turn the Page ➧

THIS MONTH . . .

ing and geophysical activity now under way in the region. There's practical information about drilling problems, transportation, communications, and housing. Turn to **Page 76** for a look at the **Great Basin Prospects** ..... **Gilbert M. Wilson**

☐ **Management is aware** of the corrosion problem but oftentimes whether it takes full advantage of corrosion mitigation methods depends on the corrosion engineer doing a good selling job. Management's views on corrosion mitigation are set forth in an article starting on **Page 81.** A leading Mid-Continent engineer reveals some important steps his company has taken to fight the corrosion problem. **How to Sell Corrosion Mitigation to Management** ..... **Lewis Finch, Jr.**

☐ **The vision of a former governor** of Texas and his willingness to pass along a little advice to a roughneck in the old Goose Creek field provided the Big Moment in the life of C. L. Rowan, now head of one of the industry's leading drilling companies. **The Big Moment for C. L. Rowan** ..... **Page 83**

☐ **A gross investment of over $47 billion** by the end of 1954. That's the outlook for the petroleum industry. This will include $4 billion that is being spent this year for new and improved facilities in all divisions of the industry. Oil is now the third largest industry in the U. S. in terms of gross assets or investment employed. It is outranked only by agriculture and public utilities, having surpassed railroads in a vigorous postwar expansion. See **Page 84. Oil Investment Soon to Reach $47 Billion** ..... **L. J. Logan**

☐ **Oil industry management** faces a constant problem—finding persons with abilities that may be developed to equip them as leaders. With the aid of night schools, extension work, and correspondence courses, companies are doing something about the problem, too. Many of them pay portions of the expenses of employes obtaining additional classroom work. **Classroom Work a Key to Success** ..... **Page 86**

☐ **The executive paradox** is that the intense drive which builds a company can destroy the builders. Part of the executive's job is to take care of his own health. Here, in layman's language, is some sound advice from a medical authority familiar with oil men's problems. See **Page 89** for the second part of . . . **Better Health for Executives** ..... **Dr. B. B. Reeve**

EXPLORATION ARTICLES

☐ **Gamma ray exploration** has become a valuable tool through a decade of development and perfection. It is offered primarily as a method to be used in conjunction with other methods, particularly geological and geophysical work. Oil accumulations are reflected through radiation of gamma rays at the surface. By detecting the radiation, the oil and gas pools may be outlined. The method is suitable especially for pinning down stratigraphic traps in areas where such traps are indicated. It helps to locate oil near dry holes that had oil showings, gives guidance in stepping out from discovery wells, may support favorable or unfavorable seismic or subsurface data, and is a low-cost reconnaissance tool to use over large, relatively unexplored areas. See **Page 107. Gamma Ray Exploration Comes of Age—David S. Lobdell, E. F. Buckley and Dr. John W. Merritt**

DRILLING ARTICLES

☐ **Use of 11¼-inch drill collars** in 12½-inch holes has solved some of the serious crooked hole problems in the Jumping Pound field of Alberta's Foothills region. After considerable experimental work involving special tools and techniques, the latter including percussion tool tests, Shell Oil Company concluded that the answer would be found in the use of greater weight on the bit. Use of large collars is now considered standard practice by the company. In an article beginning on **Page 125,** the authors give a step-by-step account of Shell's experimental work and discuss not only the results obtained so far, but point to future plans. These include even larger collars which, it is hoped, will further improve drilling operations in steeply-dipping formations. **How Crooked Hole Problems Are Solved in Canadian Foothills. W. M. Booth and F. M. Angebrandt**

☐ **Lost circulation problems** present a constant hazard in drilling operations. A new material designed to combat this situation has been developed and proven in field tests. Beginning on **Page 134** is a description of the properties of this new material. It's a special jelly which furnishes quick resistance to flow into the formation, does not stick drill pipe, and maintains the quality of the mud in the system. **New Material Combats Lost Circulation** ..... **C. E. Clason**

☐ **A new cantilever drilling mast** that boasts many unique features is the latest product of a German designer who specializes in lightweight oil field equipment. This new mast is made of a light tubular steel to offer rigidity and maximum strength at minimum weight. Access to crown and racking platform is by ladders built inside the legs of the mast. The rig is

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easy to assemble, tear down and transport. For more details, turn to **Page 143. Germans Come Up With New Cantilever Drilling Mast**.....**Erich Bahke**

☐ **Maintenance costs big money!** Perhaps management at times does not give it the consideration it warrants. Starting on **Page 146** is an authoritative article designed to reduce repair bills. Contractors and drilling departments should see that diesel and motor men read . . . **Hints for Operators of Modern Diesels**.....**Edward B. Rawlins**

PRODUCTION ARTICLES

☐ **Setting fire to an oil reservoir** in order to lower viscosity is a new method of oil recovery that has attracted considerable attention throughout the industry. Details of this project are somewhat complicated . . . involving thermodynamics and kinetics. Believing that you would perhaps be more interested in seeing just what the field installation looks like, we have arranged for . . . **A Quick Tour Through Magnolia's Research Facilities on In-Situ Combustion of Oil—Page 163**

☐ **Secondary recovery to equal primary recovery . . .** that's the outlook in Texas' second oldest oil field. Here the good and the undesirable combine to make this one of the most interesting water-flood projects ever. Oil is thick . . . field is faulted . . . and bottom water poses a problem. On the good side are uniform permeability, high porosity, and low development costs. Out of these conflicting conditions came a successful pilot flood which led to full-scale recovery now under way. For more details turn to **Page 168. Flood to Double Recovery in Pioneer Texas Field**.....**Bert S. Guthrie**

☐ **Water encroachment in multizone gas wells** is becoming increasingly severe in the giant Hugoton gas field of the Texas Panhandle and Oklahoma. Would it be best to plug the bottom zone, or syphon off the water? Spinner and well caliper surveys have provided accurate data upon which to select the best approach. What is being done . . . how it is done . . . and the results are described in an article starting on **Page 174. Water Shut Off at Hugoton**. .**M. M. Sorenson**

☐ **Rod pumping dual zones** is developing fast. A recent dual pump hookup makes it feasible to pump two low-pressure zones simultaneously. Production from either zone can be controlled by several methods. Various dual rod systems are discussed briefly . . . factors which mean economy in dual rod pumping are presented . . . and cross-sectional diagrams of a new pumping system and volumetric data are given in an article that begins on **Page 178. Rod Pumping Two-Zone Completions**.....**Donald F. Taylor, Jr.**

INTERNATIONAL ARTICLES

☐ **The price Roumania has had to pay** for crude production under the Russian thumb has not been worth the meager results. Turn to **Page 199** to learn what happens when an economic system, such as that under which oil operates, is ruled solely on an emergency basis. **Roumanian Oil Industry a Soviet Carbon (Part 2)**.....**George Rosu**

☐ **Why not take a scientific approach** to planning, development and controlling the organization of a company and the manpower required to operate it? Such an approach is used to meet the major and even minor operating problems of one oil company. For a description of how it works and the results, turn to **Page 204. Manpower Development and Control—A. R. Taylor**

☐ **Another look** at one of the new oil fields of the world. Assam Oil Company, Limited, is sparing no effort to determine the extent of its new discovery of oil in India. An article beginning on **Page 206** offers a quick look at what has been accomplished and what Assam Oil plans hold for the future. **How Important Is India's New Oil Field?**.....**Don Kliewer**

Coming August 15

. . . WORLD OIL'S annual International Operations Issue. In this issue you will find a wealth of data covering all phases of the oil industry for the calendar year 1953 and, in many instances, the early part of 1954.

The International Operations Issue, long used as a reference book, includes an appraisal of the mid-year outlook in the U. S., as well as complete information on 1953 drilling, producing, and exploration activities in each country where oil is being sought and found. This issue also includes world summaries.

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Indexed by Industrial Arts Index and Engineering Index

LETTERS

Ohio's 'Import Problem'

Sirs:

An event occurred recently in Ohio that probably was not too important to the rest of the oil-producing fraternity, but which was very important to those of us engaged in the oil-producing industry in Ohio.

We were notified that, effective immediately, our runs must be curtailed to 75 percent of the first five months' average of 1954. Following are excerpts of a letter to the Ohio Oil and Gas Association outlining our plight and the unfairness of the situation.

". . . we have been hearing a lot during the past couple of years about 'import oil.' Just what is import oil? What difference does it make to the producers of Ohio whether this import oil is produced in Venezuela, Saudia Arabia or Illinois, as long as it displaces our crude from its rightful market?

"To illustrate my point, Ohio has about the third largest registration of automotive vehicles of any state in the U. S., and by the same yardstick, we have about the same rate of consumption of oil products. To supply the petroleum products for the vehicles of Ohio, the refineries in the state have to run more than 350,000 barrels a day through their plants. Yet, in view of all this, they can't find a home for our puny 7 to 8 thousand barrels a day. It appears that Ohio has an 'import problem.'

"One of the largest of Ohio refiners goes to great length to advertise on radio and television 'Ohio products for Ohio people' and I dare say that you could almost drink all the Ohio crude that they refine daily. Our present market for Corning crude buys 'foreign oil' for about 75 percent of their requirements, and yet expects Ohio consumers to buy their finished products. This was alright as long as there was a market for all the Corning that we could produce, but it is not alright when they ask us to buy 'foreign oil' and shut in our own production.

"To further illustrate the injustice of proration in Ohio, let me point out that the July production allotment for Kansas was recently set at 325,000 barrels a day, yet Kansas has a total population of somewhat less than the Cleveland metropolitan area. I also understand Illinois is producing at a peak rate of approximately 180,000 barrels a day with no restrictions whatever, either by the state or the crude purchasers. Still the Ohio refiners claim they can't handle the 7000 barrels a day produced in Ohio.

"It would seem that Ohio has a serious 'import problem' and we should not stand idly by and watch our market disappear as we did when the 'Big Inch' gas lines took our natural gas market.

"The time has arrived when we should try to find some defensive measures to combat this situation. For the present, I would suggest a publicity campaign designed to tell the people of Ohio how the local oil producer is being shoved around and I would further suggest contacting all refineries in the state to see if any of them would be sympathetic to our problem and mindful of the welfare of the producers of Ohio. If this fails, I would suggest investigating the possibility of obtaining some sort of legislation to give Ohio producers their fair share of the Ohio market.

"It seems almost absurd that in a state such as Ohio, where so much crude oil is imported daily and products are marketed therein, that the refiners gag and have such a fit over our producing 7000 barrels of oil per day, when there are hundreds of *townships* in Kansas, Oklahoma, Texas and other states that produce more than that, and then have to pipe line it for hundreds of miles because there is no local market; and yet, we are told we in Ohio are producing too much oil.

"Our association should give this matter some thought and attention immediately. Surely there is some way to untangle a situation as unjust and unfair as this . . ."

B. R. STRAKER, President
Oxford Oil Company
Zanesville, Ohio

Slim Hole Comment

Sirs:

The section of your May issue devoted to slim hole drilling problems is a fine piece of work. It reflects considerable credit on your staff and furnishes some excellent information to the drilling industry.

The assembling of the data into a number of articles will enable a more accurate view to be had of the many problems involved in slim hole drilling techniques.

I believe your magazine performed a real service to the drilling industry.

G. C. MCDONALD
Division Drilling Engineer
Gulf Oil Corp., Tulsa

Sirs:

I want to compliment WORLD OIL on the May issue devoted to slim hole drilling. The articles are informative and a terrific amount of study and statistical research must have been necessary for the information presented.

I want to thank you personally and I am sure all drilling contractors will receive many benefits from this type of article.

J. RUSSEL YOST, Vice President
Zephyr Drilling Corporation
Tulsa, Okla.

Sirs:

I have read WORLD OIL's very interesting and informative report on slim hole drilling and sincerely appreciate the opportunity to comment on such a worthwhile article.

I am sure the trend will continue toward slim hole drilling because the ideas and techniques advanced seem sound and practical. Since this type of drilling offers so much potential value, my only suggestion would be to have a similar follow-up article next year.

J. J. HOYT, JR.
General Superintendent
Pan American Production Co.,
Houston

Sirs:

. . . this was a very necessary and timely study for the oil drilling trade. I am convinced that slim hole technique will be universal in a very short time and that it is necessary for all concerned—management, contractors, drillers, and tool manufacturers—to learn all they can in this direction.

I consider this study and report has pretty well summed up the present state of developments of slim hole technique and I believe rapid strides will be made in the next two years.

With low allowables and high well cost it is absolutely necessary, from the standpoint of payout, that the full advantage of slim hole techniques be developed as soon as possible.

WORLD OIL's report on this subject

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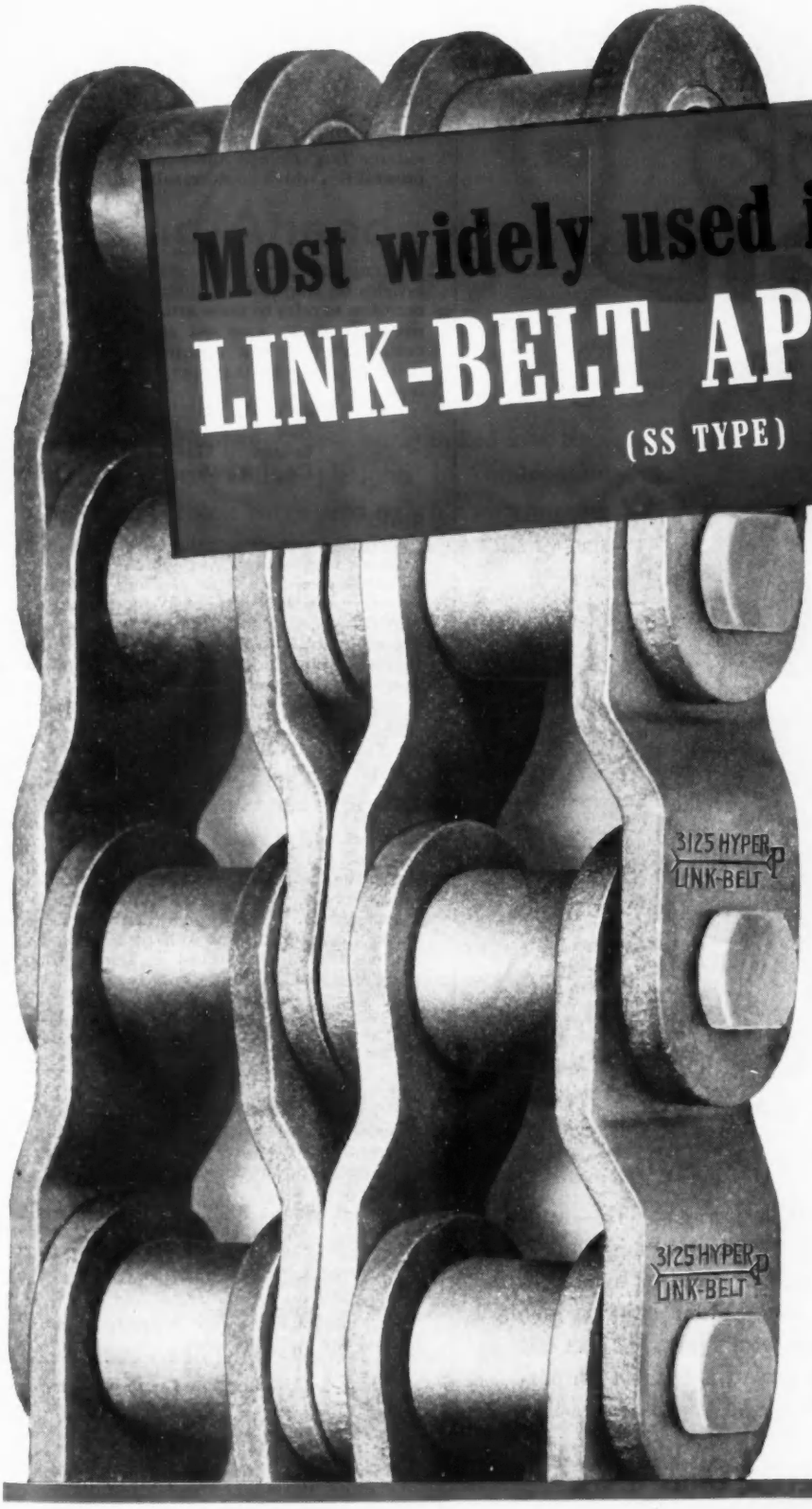

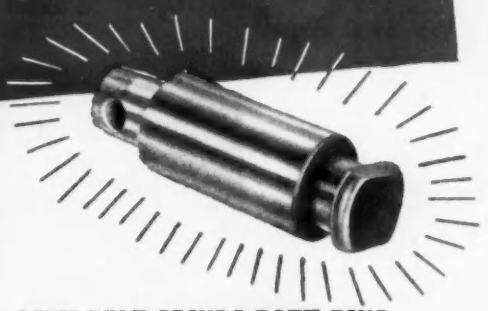

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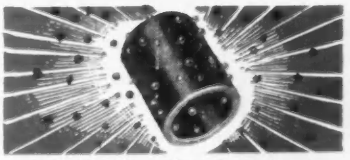

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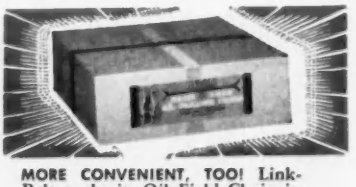

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should give necessary impetus to the development of slim hole technique.

Although I think your definition of slim hole is satisfactory, for the moment, I would have liked to see an enlargement of the idea of extremely small bore casing completions. I hope your next report to the industry will enlarge this concept and explore the many possibilities which could result.

W. E. Boyd

Sirs:

I enjoyed very much your most timely articles on slim hole drilling. We have had occasion to refer to these articles many times since the issue came out as we have just completed our first venture in slim hole drilling on a well that was drilled to 5487 feet.

Max L. Riley
Asst. Mgr. and Chief Engineer
Southwest Gas Producing
Co., Inc., Monroe, La.

Sirs:

Permit me to congratulate you on the extraordinary manner in which the series of articles on slim hole drilling was presented in the May issue of World Oil.

Although slim hole drilling is still on the experimental level, I think the articles did a thorough job of pointing out the advantages as well as disadvantages . . . the articles were very good . . . even by World Oil standards.

Archie P. Farr
Petroleum Engineer
West Texas Oil Reports
Midland, Texas

Sirs:

. . . the entire presentation has been very well received. We have had numerous comments on our article and other articles. I think the material was well presented and has created much interest in this method *(slim hole)* of drilling.

J. W. Arnold
Woolf and Magee
Tyler, Texas

Sirs:

. . . we also have had many requests for additional information on slim hole drilling techniques. We appreciated the publication very much and are looking forward to your next issue.

Henry B. Brack, Vice President
Brack Drilling, Inc.
Wichita, Kansas

Sirs:

. . . your articles were interesting, informative and well received.

W. F. Herbert
Division Petroleum Engineer
The Texas Company, Houston

Sirs:

The section devoted to slim hole drilling was quite thoroughly and carefully presented. The discussion of the problems involved, particularly as it pertained to rock bits needed, should be of benefit to anyone interested in slim hole drilling.

Wiley B. Noble
Vice President-Engineering
Reed Roller Bit Co., Houston

Sirs:

You are to be commended on your presentation of the problems and accomplishments concerned with slim hole drilling.

Joseph H. Kenny
Well Reconnaissance, Inc., Dallas

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

Looking Ahead . . .

. . . **Offshore innovation** now being talked is a template-type drilling platform in combination with a mobile barge used only for warehousing and crew quarters. Advantage of mobile unit is that it can withstand weather much more intense than the 15-foot waves which send a floating tender scurrying for port.

. . . **Business activity,** now 10 to 12 percent under the peak, will probably be on the rise late this month. But experts figure upturn will be moderate, expect no boom revival short of war. Presidential Adviser Gabriel Hauge told Governors' Conference that country is catch- its breath for an increase in national production of goods and services to a rate of $450 billion annually in next five years.

. . . **Good yardstick** of prosperity is the booming construction industry, which in June rose to $3.3 billion, with both private and public building at peak levels. This brought the total for the first six months to a record $16.6 billion, more than $300 million above 1953's all-time high.

. . . **Industry will** feel impact of a new military training program. To replace draft act, which expires next midyear, new plan likely won't be proposed by President before January. Basically, it will approximate universal service, will apply to all men reaching 18½, will be intended to build huge trained reserve.

. . . **Pigeonholed for use** in event of hostilities is a war-risk insurance program including tanker cargoes. The insurance will be available only if the Commerce Secretary finds that coverage is not available on reasonable terms from commercial companies.

. . . **Britain hopes to save** 10 to 11 million tons of coal within a few years by constructing new power stations near oil refineries and equipping them to burn either oil or coal.

. . . **The military will need** almost 70 million barrels of J-4 jet fuel during the 1955 fiscal year, reflecting a continued switch to jet fuel aircraft and a further buildup of the air force, the National Petroleum Council was told.

. . . **To oil's Magic Barrel** add a new petrochemical—C-Oil, expected to result in a host of pioneer products, including paints with greatly increased resistance to scratching, harsh chemicals and other abuses. Developed by Standard Oil Development Company, C-Oil has been subjected to seven years' experimentation. Glass-like plastics which may be machined almost like metal have been made from the new product. Its unusual electrical properties indicate its future use in high frequency electronic equipment.

. . . **A formula for prorating** natural gas in the San Juan Basin which will serve as a pattern for similar regulation in large basin areas where conditions are complicated—this is a goal of the New Mexico Oil Conservation Commission. New rules will establish a formula for determination of deliverability of wells, with allowables also based on acreage. It is expected the first order will apply to the Blanco-Mesaverde area.

NEW PACKER HELPS SET RECORD FOR PERFECT RUNS

Steel supports 40.6 sq. inches of the Packer and transmits load to the Anchor.
9.0" Hole
Expanding Shoe supports 13.3 sq. inches of the Packer.
Packer and Shoe compressed—full mud column on Packers.

ADDS MUCH TO SUCCESS OF

HALLIBURTON'S HYDRO-SPRING TESTER

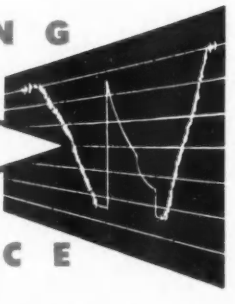
This new Expanding Shoe Packer has a hard rubber shoe with a steel sole that prevents packer from extruding beyond its working limits. The shoe decreases drag going in hole, minimizes pulling and jarring to release packer, returns to shape readily, and comes out of hole intact with little or no rubber to be drilled out.

These big new benefits add much to the phenomenal success of Halliburton's Hydro-Spring Tester, the most mechanically-perfect testing tool ever developed. In two years of use on some 20,000 jobs, you can count on your fingers the times it has failed. No other tool has equalled that record. And, when the string is back on the walk, you've got a pressure recording from the Bourdon Tube that is the most accurate and complete record available.

Make it easy on yourself when you make a test . . . make it Halliburton. You'll save time, trouble, money—and you'll get the credit for the smoothest test ever performed. Phone your local or district Halliburton office, just minutes away. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

Hydro-Spring Tester—Patent Applied For

TESTING HALLIBURTON SERVICE



HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST

Was He an S. O. B.?

"— — — — — was an s.o.b., if there ever was one!"

The remark made several years ago, was about the head of a big institution that operated all over the U. S., and some other countries, too. The speaker was a man who was expressing an opinion which no doubt had been expressed by a lot of people, because the company head in question had probably personally fired more men than almost any other man occupying an equivalent position.

"He would rather fire a man than eat . . . why, over in Louisiana he . . ."

But *was* this man an s.o.b., or anything of the type of person whom we classify with such language?

No. As a matter of fact he wasn't. He was a man who liked his fellow man, who loved his family as much as you or I love ours.

He was tough as a boot, yes. Or rather he seemed to be.

•

I was with him at his home one night only a few years before he died. We sat out in the dark and talked about our jobs, what we liked about them and what we didn't like.

"I have a reputation of being a hard-boiled, tough 'un, without a conscience, without any warm blood in my body," he said. And privately I wondered if he really knew how bad his reputation was.

"But these people who say I am without a heart," he continued. "I wonder if they realize the kind of jobs I have been handed.

"First I was given the task of cleaning up a certain situation. It was plenty tough there. Thievery plus inefficiency were wrecking the operation. It looked like the company would have to pull out of the country. I was given the job of cleaning up. I did my best and it required the axe for a lot of persons. But I wonder if those who were left realized that they kept their jobs because the others had been fired.

•

"I guess that started my reputation. I was given a similar job in other areas where improvement in efficiency was necessary to keep things moving, and some employes had forgotten to be efficient. Maybe I made mistakes . . . I never knew a person who didn't make some . . . and now I am the cold blooded killer of men's hopes.

"Being made head of this company is not much recompense for what I have had to do to keep things on an even keel . . . but I wish there was some way for those who didn't lose their jobs to know that while I was firing other people I was protecting their jobs and the ability of their company to keep meeting a payroll."

The man is dead now. But I wonder if some people didn't misjudge him.

What would the situation be on a ship if the captain didn't demand efficiency. What would the situation be in your company if somebody didn't have to do the unpleasant jobs as well as the pleasant ones.

Authority is fine . . . yes. It carries with it a lot of prerogatives. But it carries responsibilities, too. Maybe the boss doesn't have it so good, anyway!

Ray L. Dudley

MAP OF WESTERN STATES showing approximate outline of Great Basin and location of Shell Oil Company's discovery well southwest of Ely, Nevada. Some believe the Great Basin extends into southwestern Arizona also. But Paleozoic section there, although similar structurally, is believed to be thinner.

Shell Oil Company's recently-completed discovery well in Nevada, pumping about 350 barrels of oil per day, gives every indication of top importance and significance. It's the first production for the state and has caused the industry to turn for a look at the . . .

Great Basin Prospects

By GILBERT M. WILSON, WORLD OIL Staff

WITH THE COMPLETION by Shell Oil Company of its Eagle Springs Unit 1 for approximately 340 barrels per day of 27.8 gravity crude, Nevada officially became the nation's 29th oil producing state.

Production tests still were continuing on the discovery well in early July, and settled production rate had not been determined. But the significant thing immediately apparent is that oil in commercial quantities definitely has been proved to exist in the Great Basin, a vast geologic province that covers the state of Nevada, western Utah, southern Idaho and parts of eastern California and northwestern Arizona. It is an area embracing some 70,000 to 80,000 square miles.

Production is coming from a 280-foot section of open hole. The formation is a cemented pyroclastic material of volcanic origin. The well, which had reached a total depth of 10,358 feet, was plugged back to the presently-producing interval at 6450-6730 feet. The producing formation is of Tertiary age. The well was spudded January 12, 1954, and completed, pumping, on June 14, 1954.

The discovery well is situated in Nye County, on flat valley floor near the eastern edge of Railroad Valley, an arc-shaped, generally northeast-southwest trending valley ranging in width from 10 to 20 miles. The site of the well is some nine miles south-southwest of Currant, the latter being on U. S. Highway 6 about 52 miles southwest of Ely.

Regional geology complex. The Great Basin is complex, both geologically and structurally. Commonly referred to as the Basin and Range Province, the region comprises great thicknesses of sedimentary and volcanic rocks, broken up into many north-south and northeast-southwest trending horsts and grabens. Railroad Valley, which is in Nye County, in eastern Nevada, is typical of one of these grabens, being a relatively flat valley floor flanked on the east and west by mountain ranges that rise to elevations of from 8000 to 11,000 feet. Elevation of Shell's discovery well is 4769 (KB) feet.

Only a relatively few wells have been drilled in Nevada; perhaps some 40 in all. Of these, only ten have been undertaken by major oil companies, carried to depths that might be considered deep tests, and based on detailed geologic research of the particular areas tested. These ten wildcats were drilled since about 1950. Of these, nine were abandoned as dry or inconclusive; the remaining test being Shell's successful completion in Railroad Valley.

Detailed geological information of the region embraced by the Great Basin is relatively scarce. But completion of the Shell well, coupled with

field work in adjacent ranges, has made it possible to put together a fairly complete picture of the geology in the vicinity of Railroad Valley. It should not be presumed, however, that findings in this particular section would necessarily apply to other parts of the province. Sedimentary changes and much complex faulting, both major and minor, make it necessary to closely examine the geologic picture wherever a well is contemplated.

Railroad Valley is located near the center of the eastern half of the Great Basin. During Paleozoic time, this part of the basin was a part of the Rocky Mountain Trough located between the stable craton on the east and the Pacific Trough on the west. Sediments deposited in the Western geosyncline consisted of great thicknesses of volcanics, graywackes, dark shales and silicious limestones, most of which were subsequently metamorphosed. In the vicinity of Railroad Valley, however, more moderate volumes were deposited, consisting of limestones, sand and shale, all deposited, as determined by fossils, in shallow water.

A typical section (generalized) of the Paleozoic beds in the Railroad Valley are as shown in Table 1 (See Page 78.)

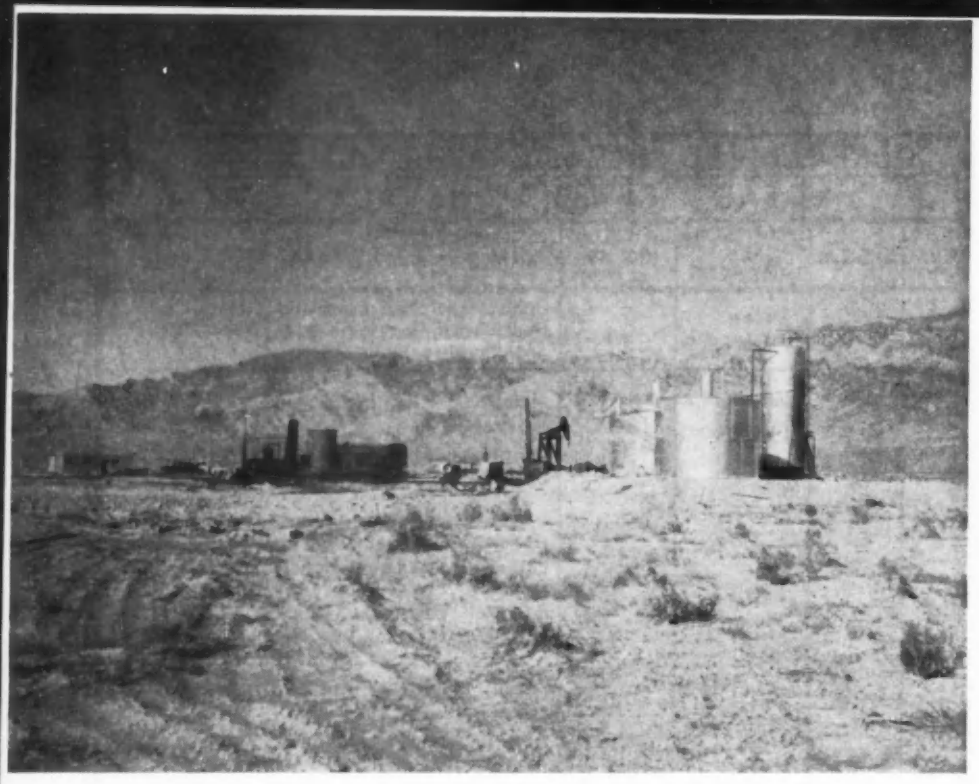
At the end of Permian time the area was uplifted to become a barrier between western and eastern basins, and during Mesozoic time it probably was subjected to deposition of fresh water sediments and some volcanics. During Tertiary time (present production is from Tertiary rocks) the region started to become broken up into what is now known as the basin and range type structures, with sediments being deposited in the valleys by lakes, streams and landslides. In addition, volcanic ash, tuff and lava flows were widely distributed in the valleys and on the ranges.

Since Shell's discovery produces from Tertiary beds, that section is of particular interest. In one part of the Grant Range, which borders Railroad Valley on the east, at a point about 7 or 8 miles northeast of the well, there are some 13,000 feet of presumed Tertiary beds exposed. These exposed beds consist principally of tuffs, tuffaceous sandstones, and conglomer-

GENERALIZED STRATIGRAPHIC COLUMN, EAST CENTRAL NEVADA*

ERA	SYSTEM	SUBDIVISIONS and THICKNESS	LITHOLOGY (not to scale)	REMARKS
CENOZOIC	Quaternary	Recent Pleistocene		Undifferentiated Lake And Stream Sediments, Fanglomerates, Basalt And Rhyolite Flows.
	Pliocene-Miocene	Humboldt Fm. 0 to 5800'		Sandstone, Tuffaceous Sandstone, Tuff And Ash, Mudstone, Siltstone, Conglomerate, Fresh Water Limestone, Shale, And Oil Shale. Beds Of Similar Lithology Over 13,000 Feet Thick, Probably Equivalent At Least In Part, Occur Near Currant On The East Side Of Railroad Valley.
	—?— Eocene	—?— Pre-Humboldt		Fanglomerate. White Tuffaceous Beds With Basalt And Rhyolite Flows Reported By W. H. Easton ("Pacific Pet. Geologist"; April 1954, p.2)
MESOZOIC	Cretaceous			White Tuffaceous Beds, Black Shale, Conglomerate, Siltstone And Sandstone Reported By W. H. Easton ("Pacific Pet. Geologist"; April 1954, p. 2)
PALEOZOIC	Permian	Arcturus Fm. 1100'+		
	Penn	Ely Ls. 1500'-3500'		Bird Spring Ls. And Callville Ls. Of Southeastern Nevada Are Approximate Equivalents.
		Diamond Peak Qtzt. 0-3500'		
	—?— Miss.	Chainman Sh. 300'-1800'		Scotty Wash Qtzt. In Proche Area. White Pine Sh. Is Applied To Pilot-Chainman Section Where Individual Units Are Not Reconizable.
		Unnamed Ls. 0'-700'		
		Joana Ls. 100'-400'		Devils Gate Fm.
	—?—	Pilot Sh. 100'-900'		—?—
		Guilmette Fm. 1400'-2700'		Nevada Ls.
	Devonian	Simonson Dol. 1100'±		
		Sevy Dol. 1100'±		
	Silurian	Laketown Dol. 900'-1300'		Lone Mountain Fm. Roberts Mountain Fm.
	Ordovician	Fish Haven Dol. 500'±		Hanson Creek Fm.
		Eureka Qtzt. 125'-500'		
		"Pogonip Ls." 1200'±		Garden City Ls.
	Cambrian	9000'±		Carbonates In Upper Part, Mainly Clastics In Lower Parts.
	Pre-Cambrian			Igneous Rocks And Strongly Metamorphosed Sediments.

*Summarized From Stratigraphic Charts And Measured Sections Presented By R. C. Spivey, Shell Oil Company, At The Monthly Forum Meeting Of The A.A.P.G. Pacific Section; June 21, 1954.



DISCOVERY WELL. General view of well, tank batter, boiler and other equipment at Shell Oil Company's discovery well, Eagle Springs Unit 1, Nye County, Nevada.

ates, silty and sandy mudstones, and fresh water limestones.

The Shell discovery well, located in the graben and separated from the Grant Range horst by a fault, penetrated what was expected to be a generally similar section of Tertiary rocks. Although the beds that were penetrated, down to a depth of 7785 feet, proved to be of similar composition, correlation of the two sections is not regarded by Shell geologists as being definitely established, at least up to the present time. Production in the Shell discovery was found in a saturated section of welded tuff between 6445 and 6880 feet.

At a depth of 7780 feet, the well encountered Pennsylvanian limestone and shale, and drilled through this section to 9970 feet where shale, limestone and sandstone, presently identified as Chainman shale (Upper Miss.) were encountered. At a depth of 10,330 feet, coarse-grained, gneissic igneous rock was encountered. Drilling was halted at total depth of 10,358 feet, in quartz monzonite.

Although only the one well so far has been drilled in Railroad Valley, it is thought, based on the geophysical picture, that the structure is anticlinal. The company's second test, Eagle Springs Unit 3, between 5 and 6 miles south of the discovery, in early July was standing cemented with surface string at 764 feet. An independent group, Signal Petroleum-Tillman & Associates, was preparing to spud a contemplated 6000-foot test in the Duckwater area, 21 miles northwest of the discovery well, and situated in the extreme north end of Railroad Valley. When results of Shell's second well and those of the Signal-Tillman well are known, considerably more light will be thrown on the structural picture of the valley.

Core and drill stem tests. In reaching total depth, and before plugging back in stages to the present effective depth of 6730 feet, Shell took some 51 cores and made a total of 14 drill stem tests. Lack of space prevents giving a complete report of coring and tests. But the following highlights of tests within the presently producing interval, plus other shows encountered at greater depths, will give a representative picture of the unusual (volcanic origin) nature of the reservoir rock, occurrence of the oil, and typical core recoveries and results of tests:

6450-6508—Tuffaceous pyroclastic: red brown to tan; abundant irregular shaped clear quartz, large biotite crystals, and plagioclase feldspar. Good spotty oil staining in vesicles in drill cuttings.

6508-6528—(Core No. 3) Recovered 1 foot of fragments of volcanic rock as above. Fragments uniformly oil saturated.

6453-6528—(DST No. 2) Open 2 hours 30 minutes, faint blow 30 minutes, then dead. Recovered 50 feet slightly gassy slightly oily mud, one-half pint free oil, dark brown, in tool. Charts showed tester plugged at start of test.

6453-6533—(DST No. 2A) With 500 feet water cushion, open four hours, medium to strong blow; shut in 1½ hours. Recovered 2771 feet (24.75 barrels) fluid consisting of 23.65 barrels gassy heavy oil with which water cushion was completely emulsified; 100 feet (0.7 barrels) oily, muddy water (salinity 495 ppm); 100 feet (0.7 barrels) oil and sediment. Oil gravity 22.5 degrees; estimated pour point 80 degrees F.; No. H_2S odor.

6533-6558—(Core No. 4) Recovered 24 feet. Tuffaceous pyroclastic, red brown to tan, abundant irregular shaped quartz grains, large biotite crystals. Common fractures, in part sealed with calcite. Occasional slickensides. Rare to common vesicles varying from 1/16- to ½-inch in size. Vesicles and fractures saturated with dark brown to black oil. Estimated porosity 15 percent.

6558-6724—(Various cores and DST's) Core descriptions and DST recoveries in this interval generally similar to foregoing. Although tool plugged on numerous occasions, DST's revealed initial pressures as high as 3500 psi, salinity of water ranging from 330 to 495 ppm (With mud being 430 ppm). Heavy oil and water-oil emulsion recovered in varying amounts in each test.

6724-6737—(Core No. 9) Recovered 13 feet. Volcanic rock, gray-brown to red-brown, contains abundant quartz, biotite, plagioclase feldspar phenocrysts (?) and elongate crystals of black ferromagnesian (?) mineral showing prominent banding in a fine ground mass. Positive identification of the rock type has not been made, but presence of banding suggests a flow rock, possibly rhyolite. Core commonly fractured.

6728-6813—(DST No. 7) (in formations revealed by four cores as being similar

TABLE 1

Formation Name	Probable Age	Approx. Average Thickness	Type of Rock
Arcturus	L. Permian	1100	Mostly limestone
Ely Limestone	L. & M. Penn.	2000	Limestone
Chainman Shale	U. Miss.	1500	Shale
Unnamed	M. Miss.	600	Shale
Joana Limestone	M. Miss.	200	Limestone
Pilot Shale	L. Miss.	500	Shale
Guilmette	M. & U. Dev.	2700	Limestone and dolomite
Simonson Dolomite	M. Dev.	1100	Dolomite
Sevy Dolomite	M. & L. (?) Dev.	1100	Dolomite
Laketown Dolomite	M. Silurian	1000	Dolomite
Fish Haven Dolomite	U. Ord.	500	Dolomite
Eureka Quartzite	M. Ord.	400	Quartzite
Pogonip Limestone	L. Ord.	1200	Limestone
Cambrian	Cambrian	8000	Limestone, dolomite, shale & quartzite.

to above) With 506 feet water cushion, open 2½ hours, light blow decreasing to weak at end of test. Shut in 1¼ hours. Recovered 716 feet (7.5 barrels) gross; 210 feet (2.7 barrels) net rise. Total fluid including 420 feet (5.4 barrels) slightly oily water and 296 feet (2.1 barrels) slightly oily watery mud. Maximum salinity 525 ppm; mud 500 ppm; water cushion 50 ppm. HP 3500, IFP 310, FFP 350, SIP 1770, still rising.

6813-6822—(Cores No. 14, 15) (Similar to that in No. 9, above).

6872-6913—(Core No. 16) Recovered 32 feet. From 6872-75, flow banded volcanic rock as above. From 6875-6904, tuff, light gray to brownish gray, bentonitic, containing abundant quartz grains. Rock appears altered, possibly by hydrothermal action. Occasional tight fractures sealed with chalcedony (?). Oil staining very rare along irregular fractures. On DST No. 8, of interval 6815-6913, without water cushion, open 2½ hours, recovered 447 feet (3.95 barrels), including ½ gallon tarry oil at top of fluid and 360 feet (3.47 barrels) slightly watery mud with trace of oil and 87 feet (0.48 barrels) slightly muddy water, salinity 400-537 ppm.

Occasional non-commercial oil shows were encountered at various depths on down to nearly total depth. Depth and occurrence of these shows are as follows:

6922-6996—Spotty oil saturation in tuffaceous rock.

7010-7094—Rare spotty oil stain along fractures. Reddish brown to brick red tuff; abundant clear quartz grains and dark colored mafic minerals; rare calcite filled fractures.

7305-7316—Rare spotty oil stain along fractures of light to crean, dense to chalky limestone.

7375-7397—Occasional oil stain along fractures in dark gray to black, calcareous, flaky slickensided shale. Good 30 degree dip at 7395 feet.

7459-7475—Good uniform oil stain along fractures of shale, thinly interlaminated with limestone, gray to tan, dense, dolomitic.

7515-7534—Rare spotty oil stain in crean to tan, sucrosic, porous dolomite containing ostracods and abundant shell fragments.

7409-7541—Scum of oil with gassy muddy water in DST No. 11. Maximum salinity of water 7700 ppm. Mud before test 830 ppm. Recovered total 3966 feet gross fluid.

8058-8212—Rare spotty oil stain below 8200 feet. Limestone, gray to tan, finely crystalline to dense, cherty, fractured, fossil fragments, becoming slightly sandy below 8150 feet.

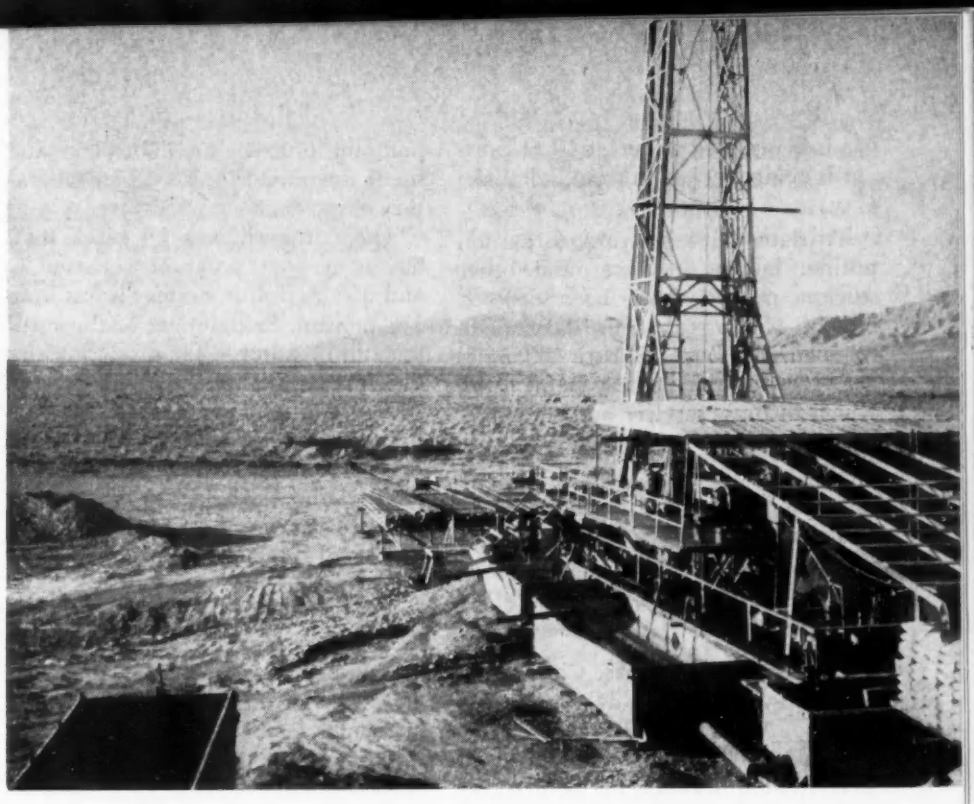
8212-8323—Rare spotty oil stain along fractures. Limestone, medium to dark brown rarely gray, dense to finely crystalline, fractured, fossiliferous in part, pyritic.

8659-8677—Rare spotty oil stain along fractures o flimestone; medium brown, crystalline fractured, fossiliferous in part; occasional brachiopods.

9040-9095—Rare spotty live oil stain in white, glassy, fine, hard, tight sandstone. Rare beds of brown sandy limestone.

9225-9320—Greenish gray, becoming gray shale, with about 10 feet of white glassy sandstone at 9250-60, with rare spotty oil stain.

(No further oil shows were encountered on down to total depth of 10,358 feet, where two feet of final core was taken (Core No. 51) in quartz monzonite.)



SHELL'S SECOND WELL being drilled by Kerr-McGee Oil Industries, Inc. View looking north toward Currant. Discovery well is situated toward mountains in distance.

Fairly easy drilling. Drilling through the Tertiary formations, which included the pyroclastic rock pay section, proved to be easier than had been anticipated. No important instances of lost circulation trouble, crooked hole or other problems were encountered in these relatively soft formations. The Paleozoic section, on the other hand, proved to be much harder drilling, consisting as it does, of hard limestones, shales, dolomites and, in the lower portions of the section, some quartzitic rocks.

The Paleozoic rocks, which make up the greater part of formations penetrated by some of the earlier tests in White Pine and other counties to the north, were responsible for the slow drilling and frequent lost circulation problems (some for as long as a week or two) encountered. Oil shows found in Paleozoic rocks in these earlier tests, while encouraging, proved to be non-commercial, due to the very tight nature of the reservoir formations.

Conventional drilling. The drilling and casing program of Shell's discovery included setting of 13 3/8-inch surface string at 1018 feet and cemented with 825 sacks, then drilling on down to total depth, coring at intervals and making formation tests at selected points. On reaching total depth, hole was plugged back and 7-inch casing was set at 6450 feet and cemented with 450 sacks. The saturated section, presently open and producing barefoot, is from 6450-6730 feet.

Approximately 122 rock bits and core heads were used in drilling the discovery well to total depth. Excluding two large bits used in drilling surface hole, bit sizes included 9⅞-, 9⅝-, 9-, 8⅞-, and 7⅝-inch. Included in this total were eight diamond core heads.

Drill pipe used by Coastal Drilling Company, contractor on the discovery well, was 4½-inch, and the same size will be used by Kerr-McGee Oil Industries, Inc., contractor on Shell's second well, now drilling ahead below surface string. Jet bits will be used on the second well, and according to present plans, the drill collar string for most drilling will be 6 collars, 3 of them 7-inch and 3 6½-inch.

Fresh water is no problem in Railroad Valley, as the water table stands within three feet of the surface, and ample fresh water is obtained by drilling a shallow well (to 60 feet, at discovery well site) near the location.

Formations drilled make little or no mud, so drilling mud has to be hauled in. A caustic quebracho gel mud ordinarily is used. Liquefied petroleum

gas is being used as fuel, and at present is being trucked in from Salt Lake City.

To date, all cementing, formation testing, logging, welding and other services needed, have been ordered out of California, with Bakersfield, by road distance, about 480 miles away, being the nearest point from which to draw services and supplies.

In the course of drilling and completing the discovery well, at least six different logging and formation services were employed, including electric log, microlog, laterlog, gamma-neutron log, dip meter, velocity survey and, of course, drill stem tests.

Completion highlights. Completion of the discovery well was more or less routine. After the 7-inch was cemented, 2000 gallons of mud acid were spotted opposite the pay section and this, in turn, displaced with fuel oil, the latter being circulated for six hours. It was determined at this time that the well would not flow, although at first it did flow intermittently for about 39 hours, then died.

Following installation of surface fittings, the well was swabbed for nine hours, recovery being 62 barrels of fuel oil; then swabbed for an additional 15 hours, recovering about 290 barrels of a mixture of crude and fuel oil. During the last hours of the swabbing operation, the fluid level was at about 3800 feet. After standing six hours, the level rose to 2470 feet.

Tubing and rods and pump were run to 6450 feet, and an air-balanced type pumping unit, gas-engine driven, was installed. The well was first placed on pumping production on June 14, 1954. Initial pumping rates reported were as follows (production figures indicated are net oil):

June	B/D	Gravity	Percent cut
14	373	25.0	9
18	398	24.9	6.6
21	365	24.9	6.0
22	335	26.8	4.5
23	330	27.0	4.5
25	328	27.6	4.0
(Rods parted; returned to production June 30.)			
July			
2	343	27.8	3.5
3	350	27.7	1.4
4	340	27.8	2.0
5	348	27.7	1.5
6	343	27.9	1.1

Very little free gas is produced, although considerable gas is entrained with the produced fluid. Gas taken off at the separator at the combination heater-treater is sufficient to run the pumping unit engine, light plant and small stove used in the trailer laboratory set up near the well.

The crude oil is a jet black fluid having a pour point of between 70 and 80° F. Sulfur content is less than 1½ percent. Salt content of the small amount of water so far produced is in the order of 9000 to 11,000 ppm. Although producing barefoot, the well produces little or no sand or sediment.

Crude emerges from the well at a temperature of about 115 degrees. To prevent cooling and consequent congealing of the fluid between there and the heater-treater and the two 1000-barrel bolted wash tanks several hundred feet distant, the 4-inch flow line is equipped with a 1-inch steam tracer line. This steam tracer line elevates and holds temperature to 140 degrees until it reaches the heater-treater. Use of the steam tracer eliminates having to install a tank heating system. The boiler producing the steam is fired by crude oil.

The well is equipped with a string of 2½-inch tubing and a 2½ x 1¾ insert liner pump. The sucker rod string consists of ⅞-inch hollow sucker rods down to 3500, and conventional ¾-inch from there on down. For possible use during cold weather, it is planned to circulate hot oil down through the hollow rod section, out through a crossover valve and back up through the sucker rod-tubing annulus.

Much depends, however, on what the bottom-hole temperature will be after the well settles down after the flush production period. The pumping unit presently is operating at 14 strokes per minute with a 10-foot stroke. Casing pressure is held at about 30 pounds, normal pressure held at the trap.

In early July oil was being trucked to Salt Lake City, and something in the order of 1000 barrels had been shipped. The crude is similar in some respects, including pour point, to that produced in the Vernal, Utah, area. No plans have been announced yet for any outlet other than trucking, and doubtless any such plans will be held in abeyance until further drilling reveals the extent of the discovery.

Lack of housing accommodations presents a serious problem in area. Nearest city is Ely, 60 miles northeast of the discovery well. Rentals in this city of about 6300 are scarce, and a large proportion of the new influx presently are living in motels, trailers, or buying their own homes. Several isolated service station-store-garage communities along the highway are nearer to the well but offer only trailer space. The road to the well, south from Currant, on U. S. Highway 6, is graded, though rough in spots and partially covered with drifting sand in other parts. Some parts of this road now are being oiled.

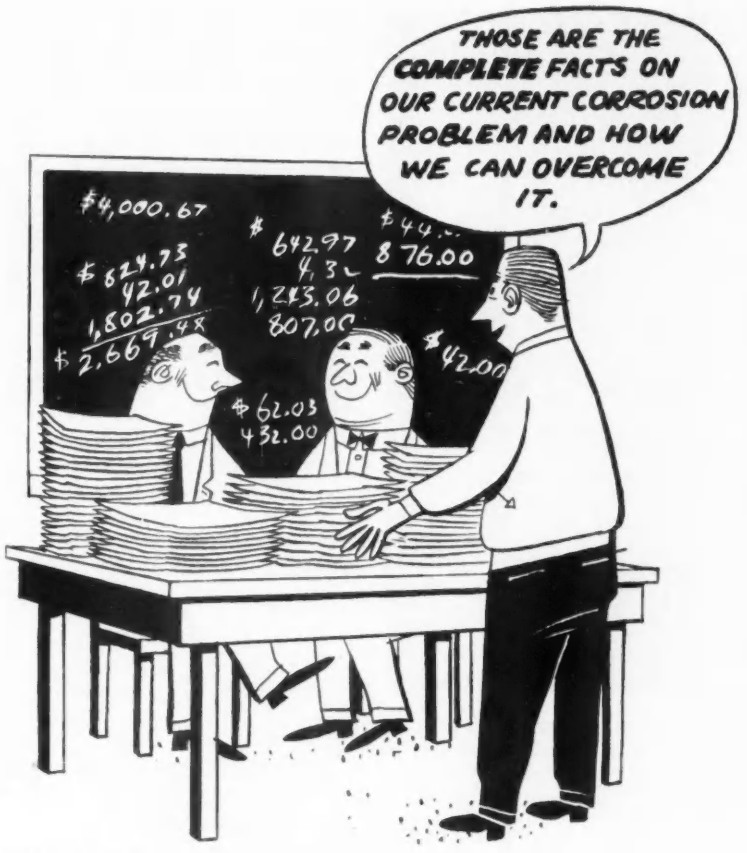
Communications has proved to be a problem in the area, with short wave radio so far being the only means of communicating with the well from the company's headquarters office in Ely. Key drilling and production personnel, as well as exploration parties, have two-way radios in their automobiles.

Although quite hot in summer, the region is subject to snow storms and fairly cold weather during parts of the winter season. On one drilling well in White Pine County, and since abandoned, drifting snow made it necessary to maintain a dozer at the well to keep roads open so crews and service units could get through.

Demand for leases in this part of Nevada, particularly since announcement was made of the discovery, has been extremely heavy. Early this year it was reported that an estimated 5 million acres had been leased and that government land offices were being swamped with requests to file leases.

Shell is reported holding approximately 100,000 acres under lease; the present discovery well falling on a 58,700-acre unit of U. S. Government land. According to Munger Oilogram, there were some 5 or 6 rigs active in the state of Nevada early in June; 3 of them in Clark County; 2 in Elko County; and 1 (Shell Oil Company) in Nye County. The Signal-Tillman wildcat, also in Nye County, was being rigged up in early July. Two of the Clark County rigs were cable tools.

Major companies other than Shell (with 2 parties in field) known to be actively leasing and conducting exploration work in the Great Basin area include (with number of geophysical parties currently at work shown in parentheses): Carter (1); Continental (1); El Paso Natural Gas (1); General Petroleum (1); Gulf (3); Ohio (1); Richfield (1); Standard of California (5), and Stanolind (1). —**The End**



He has found out . . .

How to Sell Corrosion Mitigation to Management

Economics should figure largely in recommending a program to executives.

By LEWIS FINCH, JR., Chief Engineer,
Stanolind Oil and Gas Company, Tulsa

UNLESS HE CAN "sell" management on his ideas and recommendations, a corrosion engineer cannot succeed.

Corrosion specialists, operating men and petroleum engineers have developed methods and know-how to control damage to subsurface equipment. It is up to management to take advantage of this relatively new knowledge. While much progress has been accomplished, the corrosion problem is far from complete solution; many serious problems still exist. Much remains to be done.

Stanolind Oil and Gas Company's Producing departing contends with corrosion in oil, water and gas piping, in storage and pressure vessels, in engines and compressors, in boilers and other equipment on leases, and in gasoline plants. But more challenging is the damage and control of damage to subsurface equipment in oil and gas wells. This is because the preponderance of investment is in oil and gas wells, of the inaccessibility to points of corrosion underground and of the value of the oil and gas reserves controlled by wells. About 70 percent of the producing department investment of a typical large company is in wells. Almost a quarter of this, in turn, is in steel goods. Another ten percent is in gas plants and the remainder in other surface installations, mostly on oil leases.

Many reasons exist for management's interest in corrosion mitigation:

• Wells are more expensive today. Loss of a well from the standpoint of the drilling and equipment cost alone is more important. In 1939, Stanolind's average well was drilled to 4800 feet and the cost was $25,000. In 1952, its average well was drilled to 5900 feet at a cost of $85,000.

The company is more concerned about an investment of $85,000 today than about a $25,000 investment in 1939 because, while cost of all commodities has inflated 121 percent, Stanolind's well costs have increased 240 percent. In the case of some deeper wells, investment may run up to several hundred thousand dollars. It cost $250,000 to replace one well lost in the Gulf Coast from casing corrosion.

• At greater depths higher pressure and temperatures are encountered. This places an increased responsibility on well equipment, particularly casing, and it is extremely important that it not be weakened by corrosion. Failure of such equipment may result in a blowout, an expensive repair or loss of a well. While the loss of a well is serious, blowouts mean loss of valuable reserves. In many cases, the oil or gas wasted as the result of a well producing out of control may represent a loss several times greater than the drilling cost.

• Generally speaking, more oil, gas and water zones are penetrated in the deeper wells. Thus, more potential sources of corrosion and greater potential loss of reserves exist in multiple pay fields in the event of a blowout. In many such cases, only one pay is produced at a time which means a longer producing life, especially under proration. The result: permanent well equipment may not only be subjected to more severe conditions but also may be required to withstand these conditions longer.

• In many multiple-zone wells, multiple completions are made in lieu of depleting each zone separately. Such

completions are difficult and expensive. With corrosion thrown into this complicated setup, cost of maintaining multiple completions can rapidly become prohibitive. And application of known corrosion mitigation methods to completions of this type is one of the major problems confronting the modern oil industry.

• Secondary recovery programs are being conducted in a rapidly increasing number of fields, extending the life of wells and, in some cases, subjecting them to additional types of corrosion attack.

These are some of the more salient reasons why management is concerned about corrosion. There are many others and oil industry managements are not unaware of their importance.

In 1944, Stanolind's research department discovered the first practical and successful inhibitor for mitigation of hydrogen sulfide corrosion in oil wells. This was the first tool available to the company in its fight against the most expensive corrosion problem. Later, Stanolind research people isolated organic acids as the cause of condensate well corrosion. Other companies have made similar and significant contributions until now methods of controlling various types of subsurface corrosion in oil and gas wells are known.

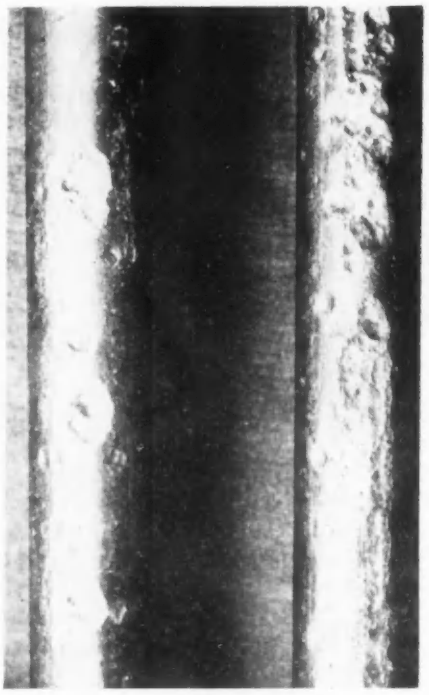
After development of the hydrogen sulfide corrosion control method in the lab the next logical step was field trials and proof of the effectiveness. Since many details were to be worked out in the field, research men went to the fields and helped work out methods of application. This met with success, and set the pattern for Stanolind's present procedure of coordinating corrosion control methods.

Stanolind has three groups to coordinate corrosion control:

- The field group, where the problems exist.
- The office group, including district, division and general offices.
- The research group.

The field group has the job of recognizing corrosion problems, applying mitigation methods known to be effective, and referring problems that it does not know how to handle to the office group.

The office group, or coordinating group, acts as liaison between the research group and the field group, promotes wider application of known



THIS IS WHAT HAPPENS to sucker rods in a pumping well when attacked by sulfide gases—just one of the corrosion mitigation problems faced by corrosion specialists and management.

mitigation techniques, disseminates new information throughout the district, division or entire company, and refers appropriate problems to the research group. The research group, of course, works on solution of new problems and development of new or more effective procedures.

Even with this organization, Stanolind found that it still was not getting the corrosion job done.

The research group needs actual contact with field problems. To achieve this, regular trips, once or twice a year, are made by corrosion research engineers to field locations having corrosion problems. Research people are accompanied by an office group representative.

On these trips, discussions are held on corrosion difficulties at each location. Similar problems at other locations throughout the company, how they are being combatted, and results being obtained are reviewed. Many questions raised by field men can be answered on the spot; others require further study.

The meetings have stimulated wide interest in corrosion among field personnel. In many cases, success of a program in one area has encouraged personnel in another area to support some corrosion control measure and ultimately make it work.

Office and research people get a complete idea of field problems. A minimum of time is spent in the meetings on actual routine field work normally done by field personnel. Only enough field work is done to make certain field representatives know their role in the corrosion job. Routine educational work and training is essential since field engineers are rotated.

In addition to meetings between representatives of various groups directly dealing with corrosion mitigation, corrosion conferences are held in field offices with pumpers, head roustabouts, gang pushers and other production men. Principles of corrosion are discussed and samples of corroded equipment are shown. A lecture outline, complete with pictures showing typical examples of types of corrosion, is given each person who attends. A discussion period also is held.

An effort, too, is made to correlate information presented in the preceding talk with actual observations and first-hand experience of the field men in the meeting. This educational program has developed support and sympathy of field men toward minimizing corrosion losses.

To further promote corrosion mitigation, Stanolind has available at all field locations a comprehensive corrosion manual.

The basic plan of these meetings was in effect when Stanolind's producing and manufacturing operations were combined, early in 1951. Similar arrangements for checking corrosion in the company's 14 operating plants have been made; however, each plant presents an individual problem. Owing largely to these intensive education and coordination efforts, Stanolind is achieving results.

In placing a corrosion program bebore management, these factors should be underscored:

• Economics. Most executives live and think in terms of dollars and cents, cost and profit, when it comes to business matters. It is the executive who must justify his actions when profits do not come up to stockholders' expectations. Management is entitled to—and needs—a complete economic analysis. It is difficult to reduce recommendations regarding corrosion mitigation to a cost and profit basis, but it is not impossible. By accumulating cost and profit in-

formation for various corrosion mitigation techniques and by free exchange of such information, corrosion engineers can equip themselves to sell management on their ideas. Management is ready to go if the economics are good.

- Use all available facilities to be sure recommendations are on firm ground. New ideas should be tested in the laboratory and in the field and all possibilities considered before large scale application is recommended to management.
- Better cooperation and understanding between field, office and research engineers.
- More basic research to develop more effective and less expensive means of controlling the variety of kinds of corrosion. Individuals can do this within their own organizations. Another approach is to encourage or sponsor corrosion research programs in colleges and universities, as well as the efforts of National Association of Corrosion Engineers.
- Development of additional and more accurate methods of determining the presence and extent of corrosion is a most important phase of research. Needed are improved methods of diagnosing occurrence of internal and external casing corrosion. With better methods of spotting corrosion in its very early stages or even before it has done any appreciable damage, more preventive corrosion mitigation practices may be used. More accurate and less expensive means of determining the extent of corrosion would ease the job of convincing management of the advisability of taking corrective or preventive measures before actual failures and/or damage have occurred.
- Inaugurate wide educational or publicity programs on the tendency of metals to corrode and need for mitigation. Articles appearing at intervals in trade journals are helpful. Exhibits at technical societies or other meetings or at any appropriate gathering where representatives of management may be present are effective. An exhibit at the last Tulsa oil show helped present the facts of corrosion.

The job of selling available corrosion mitigation practices to management is largely the responsibility of those directly concerned with corrosion. They have done a good job, but more can be done. Competent corrosion engineers are investments in the long-time value of operating properties and plants. The gigantic and costly problem of corrosion can be brought under control only through a well-planned program of corrosion mitigation, together with the combined and coordinated efforts of management, operating personnel, engineers, and the research department.

ACKNOWLEDGMENT

Prepared for WORLD OIL from a talk presented at the Corrosion Control Short Course offered by the University of Oklahoma, College of Engineering and Extension Division, in cooperation with the Central Oklahoma Section of the National Association of Corrosion Engineers, John P. Roberts, professor of Metallurgy, director.

—**The End**

About the Author

LEWIS FINCH, JR., was graduated in 1937 from Oklahoma A&M College with a B.S. degree in civil engineering. He joined Stanolind Oil and Gas Company as a roustabout at Hobbs, N. M., after graduation. He worked as a petroleum engineer in the division office at Fort Worth and became field engineer in the North Cowden field, near Odessa, Texas, in 1943. In 1947, Finch became division engineer at Fort Worth, and the following year, West Texas superintendent at Midland. He was transferred to Tulsa in July, 1948, as executive assistant to the vice president in charge of operations. On April 1, 1949, he became chief production engineer, and on Jan. 1, 1952, chief engineer of the Producing department.

Finch is a member of American Petroleum Institute and American Institute of Mining and Metallurgical Engineers. He formerly was vice president of the Petroleum Engineers club of Fort Worth.

The Big Moment . . .

for C. L. Rowan

THE VISION and faith of Ross S. Sterling created The Big Moment in the career of C. L. Rowan — the "Mister Charlie" of Rowan Drilling Company, Inc., of Fort Worth.

The late governor of Texas envisioned a splendid future for Humble Oil Company, which he founded; and he had faith in youth, especially those drawn to the industry, imaginations set a-tingle by its challenges and rewards.

The Big Moment came when Sterling visited a Humble rig on which Rowan was roughnecking at Goose Creek. "My family had known Mr. Sterling for several years," he recalls now, "and I had known him slightly. As was his custom, when visiting the fields, he would stop a minute and pass the time of day with those employes with whom he was acquainted.

"After a few minutes' conversation with me, Mr. Sterling said, 'Young man, the Humble Oil Company is going to be a great oil company some day. You should own some stock in it.'

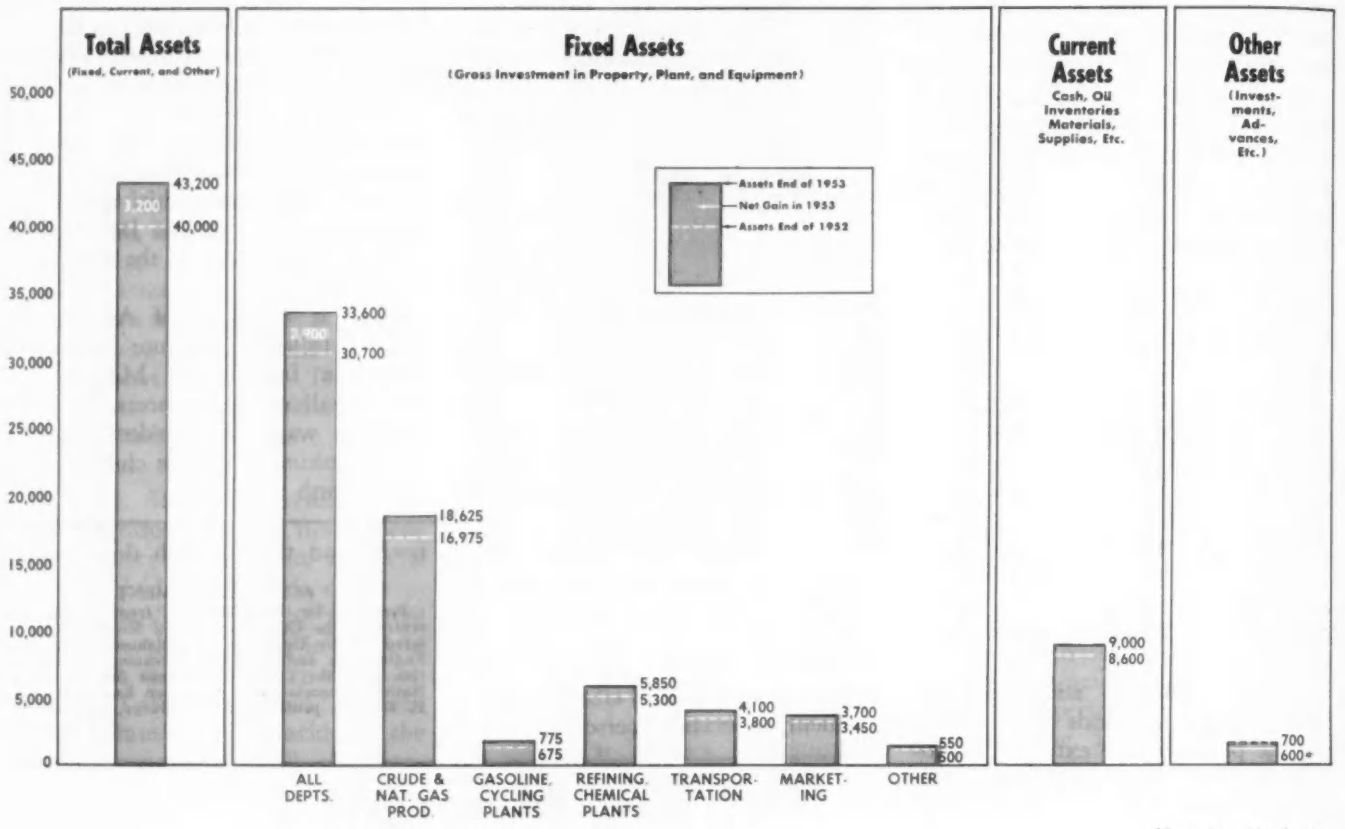
"At that time, since a roughneck's wage was $3 a day for 12 hours, with no time-and-a-half for over 40 hours, I replied that I had no money that I could spare for this purpose.

"Mr. Sterling said, 'Go to the Humble State Bank and tell them that I will endorse your note for $1000.'

"This was a big moment to me, as it was the first time that I had ever owned anything more than a $20 Elgin watch. This stock and subsequent purchases and dividends provided the capital with which I started Rowan Drilling Company." —**The End**

• Assets Employed (or Investment) in U. S. Oil Industry

. . . at end of 1952 and 1953 . . . in millions of dollars



*Represents 100 decrease

Oil Investment Soon to Reach $47 Billion

Petroleum is now third largest industry in U. S. in terms of investment employed.

By L. J. LOGAN, World Oil Staff

By the end of 1954 the petroleum industry will have in the U. S. a gross investment of over $47 billion. That amount will include the $4 billion of capital expenditures being made this year. At the middle of this year the industry's investment in the U. S. stood at about $45 billion.

Some years ago, through its vigorous postwar expansion, petroleum became the third largest industry of the U. S. in terms of investment or assets. It now is not far short of second place.

Agriculture employs an investment of over $165 billion—far more than any other industry. The public utilities were estimated in 1953 to have an investment of about $52 billion, and the total subsequently has been increased substantially, as extensive expansion has been under way in that field. Petroleum therefore has no immediate prospects of overtaking the public utilities in amount of investment. The railroads represent the fourth largest U. S. industry, with gross investment of about $34 billion.

At the end of this year the U. S. petroleum industry investment of over $47 billion will be nearly three times as great as at the end of World War II. In the nine postwar years, 1946-1954, expenditures for property, plant, and equipment in the U. S. will total about $29.5 billion. The industry investment at end of the war had been only around $17.7 billion.

The sharp increase in the industry's capital investment has reflected the vigorous postwar expansion of facilities in all divisions, but the gain has been accentuated by the inflated costs of all new facilities. The industry now has almost three times as much investment as at the end of the war, although it has perhaps only about twice as much in physical facilities, as postwar costs have been double those before the war.

Expenditures. The petroleum industry will make capital expenditures of over $4 billion in the U. S. in 1954, the API has estimated, as shown in a table herewith and in more detail in World Oil of June, 1954, Page 77. This $4 billion will include $2.2 billion or 55.0 percent for production

department facilities, $144 million or 3.6 percent for natural gasoline and cycling plants, $846 million or 21.1 percent for refineries; $315 million or 7.8 percent for pipe lines, tankers, and other transportation facilities, $370 million or 9.2 percent for marketing facilities, $66 million or 1.6 percent for fertilizer and chemical plants, and $67 million or 1.7 percent for other facilities.

The industry in 1953 made record capital expenditures of $4.6 billion in the U. S., according to Frederick G. Coqueron, petroleum analyst, the Chase National Bank, in the recently published pamphlet, "Financial Analysis of the Petroleum Industry for 1953." (See table.) Of the $4.6 billion spent in 1953, $2,975,000,000 or 64.7 percent was for leases, wells, and equipment for producing oil and natural gas. New gasoline and cycling plants cost $125 million or 2.7 percent of total capital expenditures.

Outlays in the transportation department totaled $450 million or 9.8 percent of the total, including $325 million or 7.1 percent for pipe lines, $100 miflion or 2.2 percent for marine facilities, and $25 million or 0.5 percent for tank cars and motor transport.

Refineries and chemical plants cost $675 million or 14.7 percent of the total spent.

Marketing facilities required $325 million or 7.0 percent. Other facilities cost $50 million or 1.1 percent.

Investment. Gross investment in the U. S. petroleum industry at the end of 1953 was $43.2 billion, according to the Chase National Bank report. Of that amount, fixed assets, in the form of property, plant, and equipment, accounted for $33.6 billion or 77.8 percent. Current assets, including cash, oil inventories, materials, supplies, etc., represented $9 billion or 20.8 percent, and other assets constituted $600 million or 1.4 percent.

Of the $33.6 billion investment in property, plant, and equipment at the end of 1953, $18,625,000,000 or 55.5 percent was in facilities for production of crude oil and natural gas; $775 million or 2.3 percent in gasoline and cycling plants; $5,850,000,000 or 17.4 percent in refineries and chemical plants; $3.7 billion or 11.0 percent in marketing facilities; $550 million or 1.6 percent in miscellaneous facilities; and $4.1 billion or 12.2 percent in transportation properties, including $2.7 billion or 8.0 percent in pipe lines, $1,050,000,000 or 3.1 percent in marine facilities, and $350 million or 1.1 percent in tank cars and motor transport.

ACKNOWLEDGMENT

The chart is based on data from the Chase National Bank bulletin, "Financial Analysis of the Petroleum Industry for 1953."

Estimated Assets Employed (or Investment) in U. S. Petroleum Industry, December 31, 1953

Source: Chase National Bank Bulletin, "Financial Analysis of the Petroleum Industry for 1953."

ITEM	Net Assets		Gross Assets	
	$ Million	% of Total	$ Million	% of Total
Current Assets	9,000	33.8	9,000	20.8
Property, Plant, & Equipment	17,050	64.0	33,600	77.8
Other Assets	600	2.2	600	1.4
Total	26,650	100.0	43,200	100.0

Estimated Oil Industry Capital Expenditures in U. S. in 1954

Source: American Petroleum Institute.

Department	Thousand Dollars	Percent of Total
Production, Total	**2,206,192**	**55.0**
Crude Oil, Total	2,027,730	50.5
Leases	369,146	9.2
*Wells, Equipment	1,658,584	41.3
Natural Gas, Total	75,819	1.9
Leases	13,741	0.3
*Wells, Equipment	62,078	1.6
Other	102,643	2.6
Natural Gasoline and Cycling Plants	**143,682**	**3.6**
Transportation, Total	**314,566**	**7.8**
Pipe Lines, Total	200,136	5.0
Crude Oil Lines	87,286	2.2
Product Lines	95,427	2.4
Natural Gas Lines	17,423	0.4
Marine, Total	83,940	2.1
Tankers	68,186	1.7
Barges	14,331	0.4
Other	1,423	0.0
Tank Cars	19,259	0.5
Motor Transport	8,648	0.2
All Other	2,583	0.0
Refining	**845,994**	**21.1**
Fertilizer and Chemical Plants	**66,531**	**1.6**
Marketing	**370,366**	**9.2**
Other	**66,868**	**1.7**
Total	**4,014,199**	**100.0**

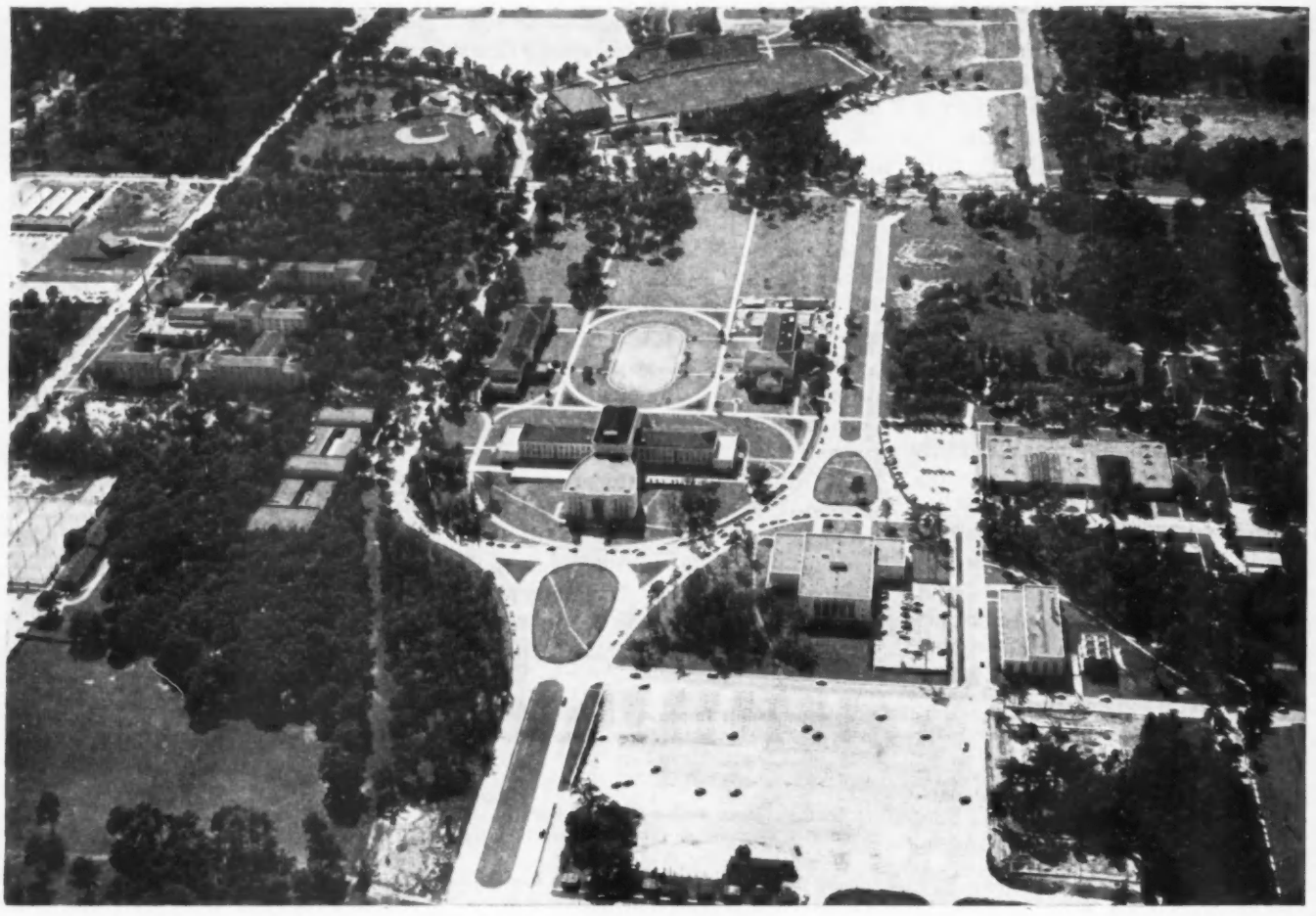
* Includes expenditures for intangible development cost of producing wells and dry holes whether capitalized or charged to earnings.

Recent Annual Expenditures for and Current Investment in Property, Plant, and Equipment of U. S. Petroleum Industry

Source: Chase National Bank Bulletin, "Financial Analysis of the Petroleum Industry for 1953"

Department	Estimated Expenditures for Property, Plant, and Equipment in Recent Years						Estimated Investment Dec. 31, 1953 in Property, Plant and Equipment			
	1952		1953		8 Years 1946—1953		Gross		Net	
	$ Million	% of Total	$ Million	% of Total	$ Million	% of Total	$ Million	% of Total	$ Million	% of Total
*Crude and Natural Gas Production	2,525	66.4	2,975	64.7	16,330	64.2	18,625	55.5	8,750	51.3
Gasoline and Cycling Plants	75	2.0	125	2.7	645	2.5	775	2.3	450	2.7
Transportation Department	400	10.5	450	9.8	2,450	9.6	4,100	12.2	2,275	13.3
Pipe Lines	335	8.8	325	7.1	1,770	6.9	2,700	8.0	1,550	9.1
Marine	50	1.3	100	2.2	560	2.2	1,050	3.1	575	3.3
Tank Cars; Motor Transport	15	0.4	25	0.5	120	0.5	350	1.1	150	0.9
Refineries and Chemical Plants	470	12.4	675	14.7	3,415	13.4	5,850	17.4	3,000	17.6
Marketing	280	7.4	325	7.0	2,145	8.4	3,700	11.0	2,250	13.2
Others	50	1.3	50	1.1	465	1.9	550	1.6	325	1.9
Total, All Departments	3,800	100.0	4,600	100.0	25,450	100.0	33,600	100.0	17,050	100.0

* Expenditures include cost of drilling dry holes, but exclude exploration expenses and lease rentals charged to income account. Investment includes only natural gas producing, transmission, and distribution facilities of oil companies.



THE UNIVERSITY OF HOUSTON is one of many educational institutions whose facilities enable them to offer courses of study to employees who otherwise, because of full-time jobs, could not complete their classroom work.

Classroom Work a Key to Success

Night schools, extension work and correspondence courses—often with company contributions—open wide vista to employes.

NIGHT SCHOOLS, extension work and correspondence courses now provide opportunities whereby many oil and gas company employes are completing or broadening their formal education, getting primary or higher college degrees, or obtaining training and education that will make them specialists in certain fields.

Oil industry management is constantly faced with the problem of finding persons with abilities that may be developed to equip them to move into positions of leadership. More and more oil companies have found it to their advantage to urge constant on-the-job training and particularly to encourage employees to become as well educated as possible.

In today's highly-specialized business world a person with a high level of classroom training has been found to be the best equipped to further his training in industry and eventually to occupy important positions.

While financial circumstances have forced many to enter industry prior to completion of their education, general availability of schools and colleges offering night term or part-time courses have made it considerably easier for them to complete their education.

It is the opinion of most in top management that an employe who has received his education as a part-time

Check the Chart!

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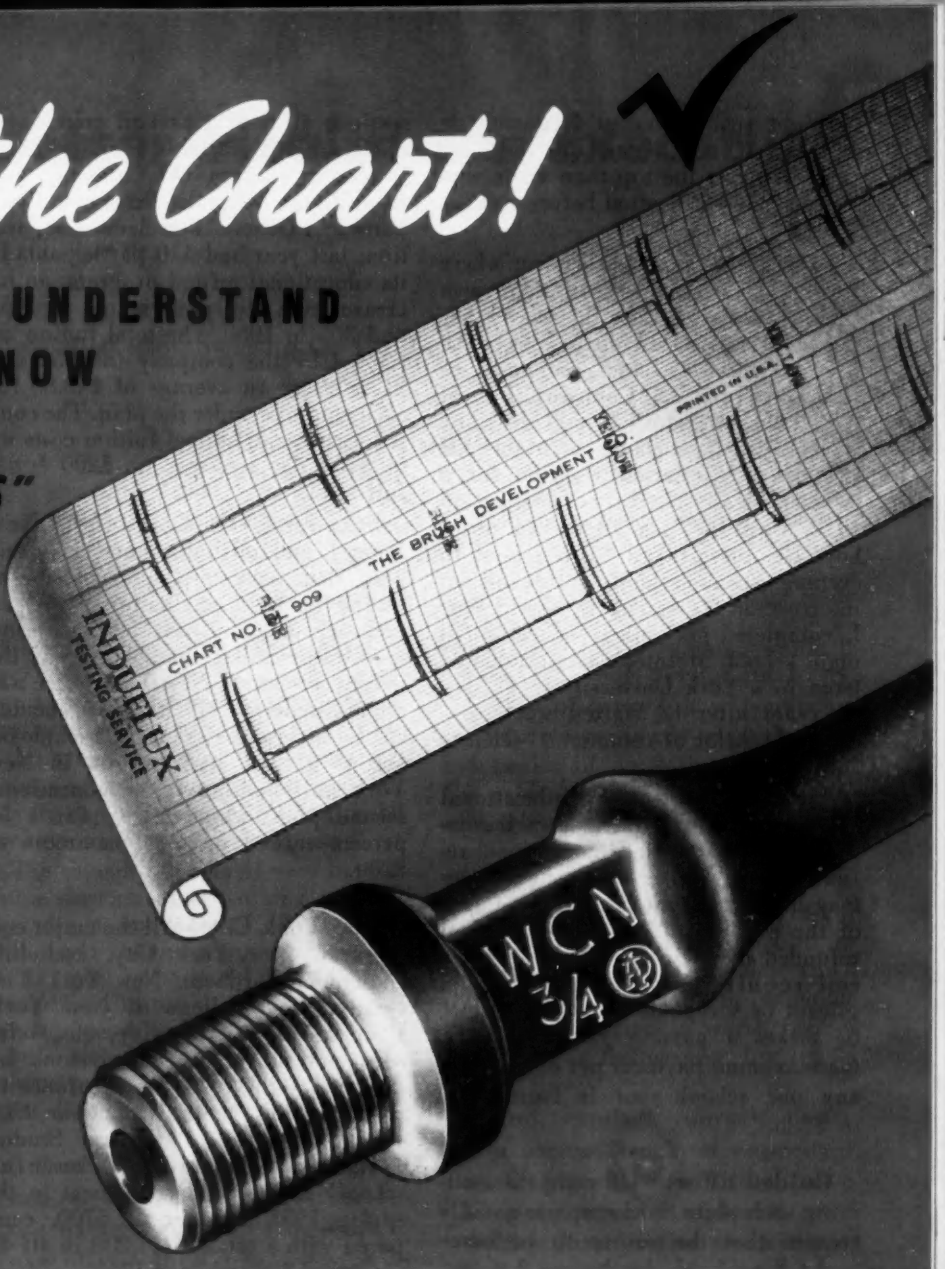

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or night school student frequently is as well, if not better, qualified for promotions to the top than those who finished their education before seeking a job.

"Every case that I've known where people have gone out on their own time to better educate themselves has paid tremendous dividends," says Albert J. McIntosh, chief economist of Socony-Vacuum Oil Company, Inc., at New York. McIntosh is well qualified to appraise the benefits of night-time schooling. He started working for a predecessor to Socony-Vacuum in 1912, when he was 14, as an office boy. He completed high school in evening sessions, and, following an interruption for service in World War I, completed his college education in night school. McIntosh was graduated from New York University in 1923—11 years after he started working—with a bachelor of commercial science, cum laude.

As part of their general educational and training programs, many oil companies have established educational refund plans, under which employes may have from one-half to two-thirds of the cost of tuition in night school refunded by their company. The general requirements are that the applicant be a regular employe and that he makes a passing grade. Usually, the maximum payment per employe in any one school year is from $200 to $225.

Guided Effort—Oil companies offering such plans to an employe usually require that the course to be taken under the refund plan be one that may have some connection with his present or possible future position in the company. The list of accredited schools and colleges where students may enroll is long, however, and the possible courses of study are broad. They run the gamut from business administration, language, photography, public speaking, and liberal arts to engineering, law and science studies. The plans also are not limited to young employes seeking bachelor degrees, but are also available to older employes who may be interested in a master's or doctor's degree.

In most companies, the prospective applicant for educational refund schooling must have the recommendation of his department head. While most employes participating in these plans take their courses in the night schools, many companies will attempt to arrange working hours so that some employes may attend afternoon school sessions if their desired courses of study are not available at other times.

Socony-Vacuum Oil Company and its affiliates, Magnolia Petroleum Company and General Petroleum Corporation, last year had 410 participants in its educational refund program, an increase from 291 participants in 1951 and 365 in 1950. The total tuition refunded by the company in 1952 was $17,959, or an average of $43.80 for each employe under the plan. The company pays one half of tuition costs up to $100 per semester or $200 for a full term.

Standard Oil Company (New Jersey) and affiliates have a refund plan that pays 66⅔ percent of the tuition up to a maximum of $225 in each school year. Last year, employe enrollment under this plan from the parent company's New York office was approximately 100. Standard-Vacuum Oil Company in 1952 had 27 employes out of a total staff of 700 in New York participating in its educational refund plan, which allows for a 50 percent refund up to a maximum of $200.

New York City—All the major colleges in New York City, including Columbia, Fordham, New York University, City College of New York, Long Island University, etc., offer night and other part-time sessions. Indicative of the relative importance of night schools there, Columbia University's School of General Studies (primarily a night and evening school) had a total enrollment in the spring 1953 semester of 5700, compared with a total of 24,200 in all divisions of Columbia in 1953.

New York University started its School of Commerce, Accounts and Finance with great emphasis on night and part-time students more than 40 years ago.

University of Houston—A noteworthy example of the value of college work for oil and gas company employes is the education being provided for many such employes in and around Houston by the University of Houston.

The U. of H. started out a quarter century ago as a junior college, affiliated with the Houston public school system, offering night courses for working students. Subsequently, it has been steadily expanded and made into a major university, with much of its progress due to the philanthropy and leadership of Hugh Roy Cullen, Houston oil operator. Now the U. of H. is among the nation's largest universities in total enrollment. And up to 30 percent of the total enrollment is composed of night students that work full time on regular day jobs.

Heavily represented among these night students are employes of the many oil and gas companies that have offices in Houston, including Humble Oil & Refining Company, Gulf Oil Corporation, The Texas Company, Shell Oil Company, Tennessee Gas Transmission Company, and others.

Tulsa University—The University of Tulsa, through its Downtown Division evening school, is making it possible for ambitious young men and women employed by the oil industry to begin, continue or complete their college education.

During the past year, approximately 800 oil and gas company employes in Tulsa availed themselves of the opportunities offered by the Downtown Division of the University of Tulsa to "learn while they earn" by attending night classes. Since Tulsa is a recognized oil center, the major emphasis is on petroleum, geological and geophysical engineering.

A complete program of studies leading to the B.S. degree is available to students of the evening school. Work leading to the M.S. degrees is also offered in several fields.

The faculty of the evening school is made up of regular members of the campus faculty and specialists from the major oil companies.

Along with the regular college courses, short courses are offered in oil company accounting, oil and gas conservation, and the oil industry through audio-visual education.

The great majority of the evening school students are adults who would find it impossible to attend day classes but who can improve their educational, social and economic status by a planned program of evening classes.

The Downtown Division is an integral part of the University of Tulsa. Texts, assignments, and instructional equipment parallel those of equivalent day classes.

University of Oklahoma—Members of the faculty of the College of Engineering of the University of Oklahoma have offered courses in reservoir engineering in the Oklahoma City area for engineers who wished advanced training in this field. Additional courses will be offered at the Midwest City study center when a sufficient number of persons indicate a desire to enroll in advanced petroleum engineering work.

The industry has also been served

through the Southwestern Gas Measurement Short Course, which is an annual event on the calendar of the College of Engineering. Last year, more than 1000 persons from industries attended this short course.

Another short course which has been received favorably is the Gas Hydrate Control Conference which is under the direction of Professor L. S. Reid, chairman of the School of Natural Gas Engineering. This short course has been offered for the last two years and it will be offered next year.

For many years, The American Petroleum Institute and The State Boards for Vocational Education, in the oil-producing states, have worked together in the development of training programs for men employed by the industry. The Oklahoma State Board and its Department of Trade and Industrial Education was one of the early leaders in the development of these programs. The University of Oklahoma is cooperating with the Oklahoma Department of Trade and Industrial Education and the American Petroleum Institute in offering courses validated by the American Petroleum Institute; and, at the present time, developing two new courses.

Jim Walker is doing the developmental work, writing the course material, and preparing visual aids for the courses, "Care and Handling of Sucker-Rod Pumps," and "Care and Use of Wire Rope." Sixteen millimeter sound pictures in color are being taken for use as visual aids in these courses.

The pump course will be taught on a trial basis this fall in order to correct deficiencies and effect improvement. The wire rope course will follow by two or three months.

In connection with this program, the course on "Treating Oil Field Emulsions" will be offered in the Golden Trend Area. Plans are being made to extend this course to Seminole, Drumright and Duncan.

A later development in the programs with the API is Supervisory Training. Two men are being added to the staff this fall to aid in expanding and improving training programs for Supervisory Personnel. These men are J. Kelly Mudd and Ted Sherman. A well-planned program is available to the petroleum industry. Companies have already participated and it is the intention of the University of Oklahoma to make this service available to all companies desiring these courses.

Business and Industrial Services are directed by M. L. Powers.

Better Health for Executives

By DR. B. B. REEVE
Medical Director, Standard Oil Company (Indiana)

Reeve

Your Working Habits

Part 2

YOU HAVE attained executive position through your hard work and your ability, and your combination of talent for administration. As an executive, you are an exceptional person with exceptional values to your organization.

A part of your work is to administer your organization, to ask yourself day-in, day-out, "How can I best fulfill my responsibility to my company?"

The smooth working of your organization depends upon working methods you direct and control. It depends, also, upon your own work habits. One of the most important factors in successful administration is continuing to develop good working habits. Your health also depends on your work habits, perhaps as much as on your other daily habits of living.

Each day is made up of 24 hours. Even though you are the exceptional person—the executive—the 24 hours were not all made for working. Each day should be divided into work, recreation, and rest. The individual executive who can avoid carrying his work into the hours he needs for recreation and rest will better preserve his health for other important days to come.

Working under pressure seems to be the habit of many in executive positions. Perhaps you've been pressured into working under pressure. Perhaps you've been schooled in this tradition. Perhaps your own incentives have led you to drive yourself—and others—under pressure.

Working under pressure can be essential, at time, of course. When it carries habitually into needed recreation and rest periods, industrial medical experience is that it travels down every nerve line of administration to the tips of your corporate body.

I have observed how continuous overtime may seriously affect the work and health of an entire department. The evidence convinces me that it is advisable—and it is good management—to avoid habitual and unnecessary overtime.

This is different: If you have—or someday develop—a tendency to be exhausted at the end of the day, you'll find that a complete 20- to 30-minute midday rest period is worth two or three hours in the evening. Just try it!

And, remind yourself that you cannot work at capacity as an executive all day, yet keep up a whirl of social activities late in the evening. You should plan for, and insist on getting, the amount of rest you need each night. Burning the candle at both ends is burning yourself out. Ultimately, it will destroy your health as well as your efficiency.

If you feel that you can't drop your business concerns at the end of the working day, I'd suggest that you develop some hobbies. To make recreation time real recreation, hobbies should be distant from your work interests. They will not only be valuable now, they will increase in value as you grow older and near the day of your retirement.

About your work habits, as about all daily habits, my best advice to you is to be moderate. In all things, moderation gives you a better chance of good health and happiness.

Note: The author is dealing in generalities. He is in no way offering relief for, nor suggesting treatment for specific ailments.

U. S. Oil Will Flow Under H-Attack Through Impromptu Guidance

Oil's genius for improvisation which has contributed so heavily to the American way of life can be relied upon as a major defense of that way of life against the perdition of the thermonuclear bomb.

Such was the assurance received last month by the Interior Department's Oil and Gas Division in reply to its request that the National Petroleum Council suggest a program to prevent interruption of the flow of oil and gas if the bombs fall.

NPC acceded to the letter of the request with a six-point program—but a program so broad and loose as not to ensnarl the extemporaneous decisions of the men who will be demanding lots of elbow room when the time comes to do the job.

Said NPC: "The greatest asset of the industry in the event of such attack would be its executives in various branches of the industry who could quickly draft emergency plans for utilizing whatever facilities remained after the bombing, and get them back into operation in minimum time."

Moreover, declared NPC, "There are so many possible eventualities in so many different areas which might result from an atomic attack that it does not seem at all feasible to set up any detailed planning as to just what could or should be done under various hypotheses."

After reiterating the necessity for a plan not constricted by picayunish details and the further necessity of administering it with "men who are thoroughly familiar with (the industry's) far-flung and varied operations and facilities," the Council offered this six-point program:

- The Secretary of the Interior should immediately name for each of the five PAD districts emergency committees to guide emergency operations of the industry on a decentralized basis.
- The names of these committeemen should be published to acquaint the entire industry with the program.
- Details of the program should be worked out now so they could be put in motion by Presidential proclamation if an attack comes.
- A PAD-type organization, responsible to the Secretary of the Interior, should be set up for central guidance and planning as soon after attack as possible.
- Industry should be urged to consider further decentralization when adding new refining or storage facilities. The companies should also be asked to consider interconnection of refining facilities and terminals in different areas by product lines whenever feasible. Gas companies should consider expansion of underground storage and interconnection of systems.
- Encouragement should be given to building up reserves of mobile transportation and equipment, particularly tankers, but also tank cars, barges and tank trucks, in view of the extra load which would fall on transportation facilities in an emergency.

Depletion in Simple Words Is No Bugaboo

The oil industry depletion allowance, repeatedly attacked in principle, now appears accepted beyond question. Still the basis for continuing debates is the rate of allowance—a topic not well understood by the public largely because depletion allowance per se is vague to the point of misunderstanding, albeit acceptance, on the part of the public.

Considerably less furore would be created by mere mention of depletion allowance and its rate if the American public were told exactly what the the allowance means in simple, easy to understand words.

One example of what should be done to explain depletion allowance and its rate is the following excerpt from an address by Hines H. Baker, president of Humble Oil & Refining Company:

"The principle of percentage depletion now seems accepted beyond question, but sometimes the question is raised whether the rate of 27.5 percent is correct. The best economic evidence of the reasonableness of this rate is its close reflection of the capital value of oil in the ground. At the present time on an average price of crude oil of $2.55 a barrel the maximum percentage depletion is 70 cents, and the average depletion is about 63 cents because of the limitation to 50 percent of net income.

"This depletion allowance agrees very closely with the discovery value of oil in the ground. In Texas, for example, a number of sales of properties have been made in recent years at a price of about $1 a barrel for proved, developed reserves. Deducting from this price a typical development cost of 30-35 cents a barrel (which is in addition to all the exploration expense), indicates a discovery value of about 65-70 cents.

"Depletion at the rate of 27.5 percent has operated similarly to reflect the capital value of oil reserves in the ground over the full range of prices experienced since 1926.

"The prinicpal and rate of percentage depletion is right according to the evidence of past and current operations not only for the industry as a whole, but also for all operators regardless of size. Small operators unquestionably need it, as amply demonstrated by evidence presented before Congressional committees this year (1950) and in earlier hearings on depletion.

"The same provision is equally necessary and fair for large companies taking exactly similar risks. Size does not protect a company against any of the real risks in oil exploration and development. Large expenditures in exploration provide no guarantee as to the number or size of discoveries, nor does the drilling of numerous wells provide any assurance that the value of the oil developed will equal or exceed the money risked."

The powerful HD-15, with 8-foot wide 15X blade, handles the biggest, toughest slush pit and dirt-moving jobs, clears land, moves drill rigs, tows or winches heavy equipment.

ALLIS-CHALMERS HD-15 TRACTOR WITH CHOICE OF DRIVES, AND BAKER 15X NO-PUSH-BEAM DOZER

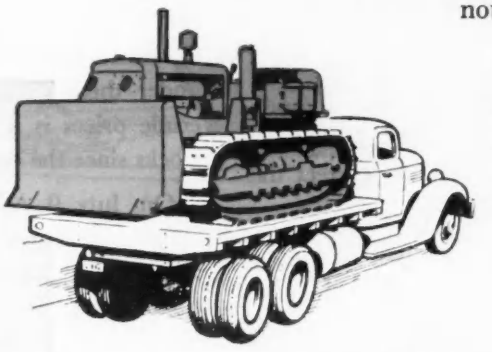
Standard Transmission

109 drawbar hp, Weight approx., 32,400 lb with dozer

Torque Converter Drive

135 net engine hp, Weight approx., 32,900 lb with dozer

8-foot blade width for permit-free highway transport



ALLIS-CHALMERS HD-9 TRACTOR AND BAKER 9X NO-PUSH-BEAM DOZER

72 drawbar hp
Weight approx., 21,700 lb with dozer
6 speeds forward, 3 reverse

The 72-drawbar hp HD-9 and 9X dozer offers outstanding, time-saving performance in digging narrow, deep slush pits — yet has the versatility to handle a wide range of oil field dirt-moving jobs.

Allis-Chalmers HD-9 and HD-15 Tractors equipped with special 8-foot wide, no-push-beam dozers are designed specifically for oil field use.

Dozer blade mounts directly to the front of the tractor main frame. This direct-to-frame mounting is made possible by the Allis-Chalmers box A-type main frame. Since this frame is a one-piece, all-welded structural unit, inside push beams and heavy, expensive, obstructing braces are eliminated. Tractor main frame-dozer combination is raised and lowered as a single unit by side-mounted hydraulic rams that anchor to truck frames.

Look at the advantages this new type tractor-dozer design gives to oil field users — higher clearance for sure going in mud, muck, and rough terrain; steeper penetration angle, greater maneuverability, better balance and traction because blade is mounted close to tractor; and greatly increased track oscillation. With no push beams the 9X tractor-dozer is 1,650 lb lighter than with standard blade; the 15X is 2,000 lb lighter. Less weight means lower original cost, lower maintenance costs, plus high-output performance.

Slush Pit Naturals

These oil field specials, with 8-foot wide blades and steep penetration angle, permit operator to dig slush pits better and faster with shorter, steeper ramps. You'll also save time building access roads and fire walls, leveling drill sites, backfilling, and on dozens of tough digging jobs.

No Transport Permit Needed

The 8-foot, highway-wide blade means you can transport either of these tractor-dozer units night or day at a moment's notice — without special permit.

Get firsthand evidence. See the Allis-Chalmers HD-9 or HD-15 with these modern oil field blades in action. Your Allis-Chalmers dealer is ready to demonstrate.

Here are some of the HD-9 and HD-15 features that keep these tractors rolling in tough going:

- *Fast-cycle shift for easy operation, increased production*
- *More power with bigger engines — longer engine life*
- *Extra heavy main frames — no reinforcements needed*
- *Long-lasting, large-diameter clutches*
- *Double reduction, straddle-mounted final drive gears with live sprocket shafts and caged bearings*
- *Positive operating track release — works in oil*
- *All new, specially designed track assembly*
- *Positive seal truck wheels, support rollers, and idlers mounted on tapered roller bearings, with 1,000-hour lubrication intervals.*

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

Crude Prices in Danger

STORM CLOUDS which have been hovering over oil markets for some months became more ominous in July. Gasoline prices tumbled as a result of bulging stock levels. Consequently, the pressure on crude oil prices was increased to the point of becoming critical.

On the brighter side of the picture, the seriousness of the situation seemed to be causing both refiners and producers to finally recognize that drastic reductions in refinery and producing operations are necessary. Many major refiners announced plans for curtailment of refinery runs. Production allowables for August were slashed, particularly in Texas.

Even though these events promised a more encouraging economic outlook is in the offing, there is doubt whether the action was taken in time. Crude prices will remain in danger as long as gasoline prices are depressed. A long period of reduced production, imports and refinery runs are essential if the industry is to avoid a collapse of crude and product prices. Any temporary short period of reduced runs, imports and production will not correct the situation. Oversupply is too great.

•

REFINERS ARE HARD PRESSED. For sometime sporadic gasoline price wars have existed in various eastern areas. In early July wholesale gasoline prices dropped in the Gulf Coast area. This was followed by tank wagon price reductions of 0.5 cents to 0.7 cents per gallon throughout most of the eastern marketing territory. Larger reductions occurred in a few spots. At the same time, gasoline price wars broke out in Denver and Los Angeles.

Consequently, refined product prices are in general lower than before crude prices were advanced in June, 1953. The margin between crude prices and product yield is down to about 60 cents per barrel, the lowest in years.

Back of gasoline price reductions are bulky inventories. Gasoline stocks in early July were 21 million barrels larger than a year ago and 56 million above two years ago. Thus, inventories are one-third greater than two years ago. Meanwhile, motor fuel demand has advanced only 7 percent during the past couple of years. Approximately 20 million barrels need to be withdrawn from storage before October 1 if the industry is to avoid excessive build-up of stocks next winter.

Behind excessive motor fuel stocks are increased refining capacity, running of too much crude to refinery stills and the failure of consumption in 1954 to live up to expectations. Motor fuel consumption during the first half of 1954 gained only 1.3 percent over the like period of 1953. Demand for other products is off.

•

LOWER CRUDE PRICES became a definite threat under these circumstances. Adding to the pressure on crude prices is a 12-million-barrel increase in crude oil stocks since the end of February.

On July 9 Ashland Oil & Refining Company cut Illinois Basin crude prices 12 cents per barrel and Eastern Kentucky by 25 cents per barrel. Saying "limits of storage facilities had been reached," Sohio Petroleum Company reduced purchases of Illinois, Indiana and Kentucky crude to 70 percent of its June volume.

Under these circumstances it was encouraging that Texas' allowable production for August was trimmed by 121,000 barrels a day. This marked the second consecutive monthly cut for the state, and put its production rate 400,000 barrels per day below the permissible flow for last April.

Whether reduced refinery runs and producing rates came in time to avoid a general price cut is problematical right now.

Whatever happens pricewise, reduced imports, production and refinery runs are needed for a number of months to do away with excessive inventories.

ideal for two-man operation...

BAASH-ROSS "2MB" ROTARY SLIPS

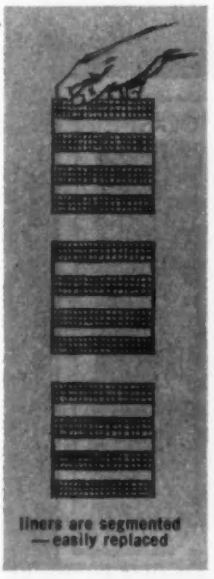
Light in weight and balanced for smooth, easy handling.

Perfected grip design *holds* without damaging pipe.

Segmented liners are easily replaced and fit both Regular (12″) and Long (16″) Types.

No load carrying bolts or pins.

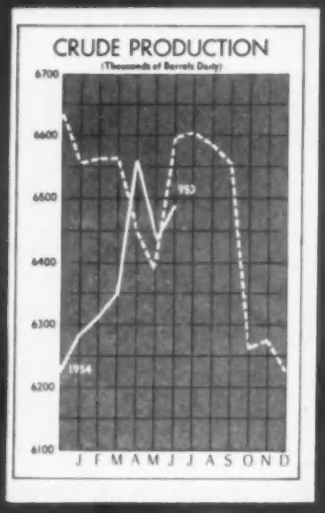
Two body sizes will handle all pipe from 2⅜″ to 7″ O.D., inclusive.

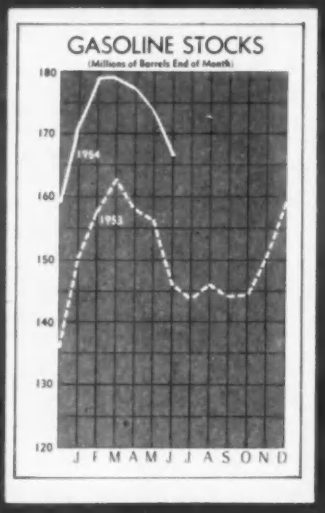


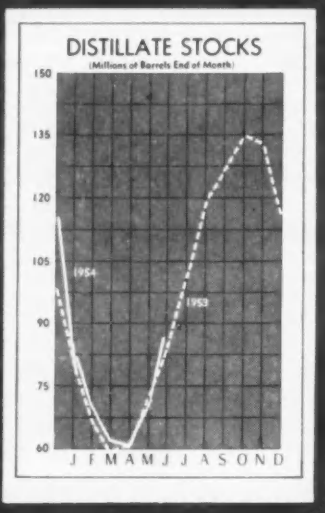
liners are segmented —easily replaced

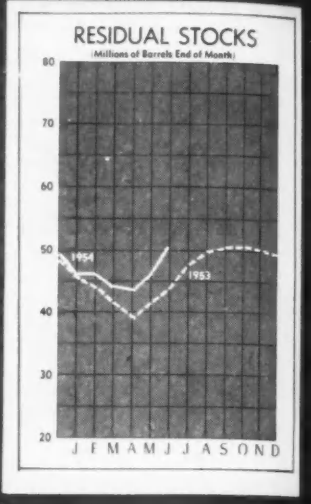
BAASH-ROSS TOOL COMPANY

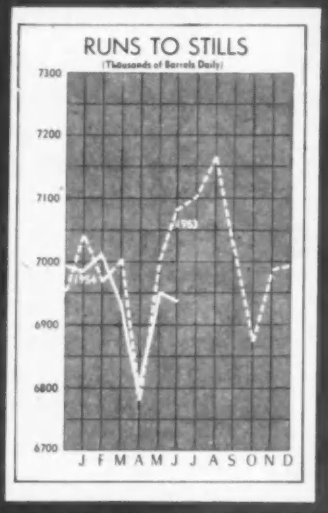
Los Angeles...Houston...Oklahoma City...Odessa...Casper...Canton, O....New York City

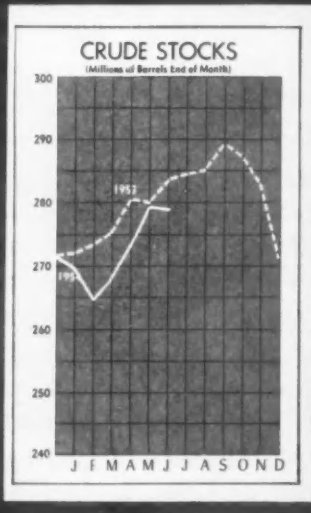












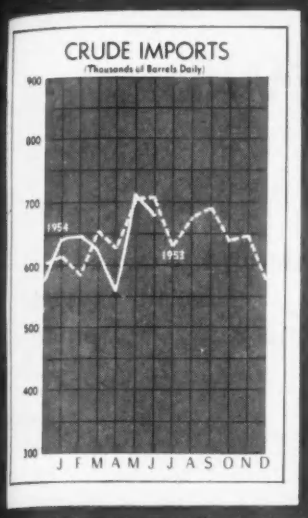
Petroleum Trends in the U. S. . . .

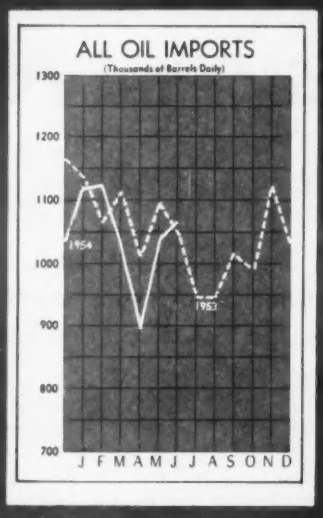
Refining rate remains high . . .

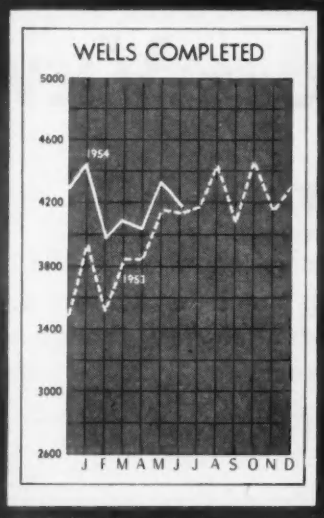
U. S. Crude Production by States

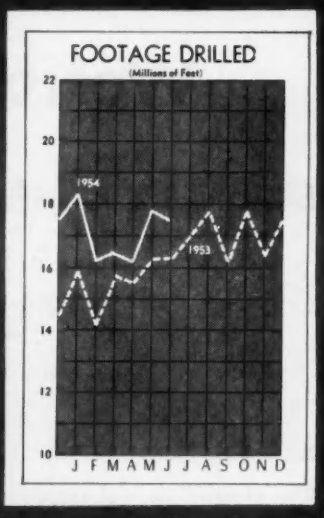
(Thousands of Barrels)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION June, 1954	May, 1954	June, 1953	% Diff. June, '53-'54	TOTAL PRODUCTION First Six Months 1954	1953	% Diff. '53-'54
Alabama	4.4	4.6	4.9	— 10.2	818	858	— 4.9
Arkansas	77.7	77.5	81.7	— 4.9	14,477	14,665	— 1.3
California	988.1	985.1	1,009.9	— 2.2	179,360	180,589	— 0.7
Colorado	126.8	125.3	89.2	+ 42.2	19,525	16,137	+ 29.0
Forida	1.6	1.6	1.4	+ 14.3	276	268	+ 3.0
Illinois	187.4	184.0	162.7	+ 15.2	32,328	29,076	+ 11.2
Indiana	29.5	31.0	37.0	— 20.0	5,727	6,613	— 13.4
Kansas	327.0	329.6	327.7	— 0.2	59,209	60,026	— 1.4
Kentucky	37.4	36.6	32.1	+ 16.5	6,686	5,575	+ 19.9
Louisiana	709.1	713.4	706.1	+ 0.4	127,635	127,702	— 0.1
North Louisiana	112.8	112.4	113.6	— 0.7	20,743	20,891	— 0.7
South Louisiana	596.3	601.0	592.6	+ 0.6	106,892	106,811	+ 0.1
Michigan	33.3	35.6	34.1	— 2.4	6,152	6,128	+ 0.4
Mississippi	92.6	92.2	96.8	— 4.5	16,883	17,884	— 5.6
Missouri	0.1	0.1	0.1	.....	30	11	+150.0
Montana	37.8	35.4	33.2	+ 13.9	6,303	5,556	+ 13.4
Nebraska	18.8	20.3	17.3	+ 8.7	3,446	2,946	+ 21.1
New Mexico	204.8	203.9	193.2	+ 6.0	36,528	33,869	+ 7.9
New York	11.4	11.5	10.8	+ 5.6	1,801	1,942	— 7.3
North Dakota	13.4	13.7	13.9	— 3.6	2,594	2,634	— 1.5
Ohio	10.9	11.2	10.3	+ 5.8	1,957	1,669	+ 17.3
Oklahoma	515.6	539.2	573.3	— 10.1	98,070	101,211	— 3.1
Pennsylvania	23.3	24.0	30.2	— 22.9	4,637	5,347	— 13.3
South Dakota	0.2	0.1	.....	.....	12	.....	.....
Tennessee	0.1	0.1	.....	.....	8	5	+ 60.0
Texas	2,764.2	2,699.1	2,874.8	— 3.8	494,385	516,960	— 4.4
Dist. 1—South Central	43.9	42.1	36.8	+ 19.5	7,608	6,574	+ 17.7
Dist. 2—Middle Gulf	149.8	146.8	159.4	— 6.1	26,801	28,823	— 7.0
Dist. 3—Upper Gulf	456.8	441.0	469.2	— 2.6	100,996	86,631	+ 16.6
Dist. 4—Lower Gulf-S.W.	252.7	246.8	264.7	— 4.5	45,677	47,049	— 2.9
Dist. 5—East Central	45.9	44.6	49.1	— 6.4	8,189	1,965	— 8.7
Dist. 6—Northeast	353.4	345.3	379.4	— 6.8	64,146	69,093	— 7.2
Dist. 7-B—North Central	119.3	119.7	115.8	+ 3.0	22,930	19,777	+ 15.9
Dist. 7-C—West Central	189.1	183.2	165.7	+ 14.1	33,120	29,969	+ 10.5
Dist. 8—West	880.6	860.4	911.4	— 3.4	156,889	166,340	— 5.4
Dist. 9—North	192.5	188.9	178.9	+ 8.1	34,362	23,460	+ 5.9
Dist. 10—Panhandle	80.2	80.3	75.1	+ 6.6	14,820	93,534	+ 9.5
Utah	5.5	5.4	4.9	+ 12.2	969	948	+ 2.2
Virginia	0.1	0.1	.....	.....	9	5	+ 80.0
West Virginia	8.1	7.8	8.4	— 3.6	1,489	1,361	+ 9.4
Wyoming	256.0	249.4	240.6	+ 6.6	54,031	39,834	+ 13.0
Total United States	6,485.7	6,437.8	6,594.6	— 1.7	1,166,345	1,178,720	— 1.1









By **CECIL W. SMITH,** World Oil Staff

Fuel stocks continue build-up . . .

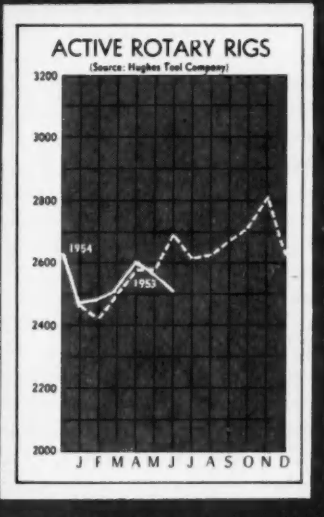
. . . Drilling eases slightly

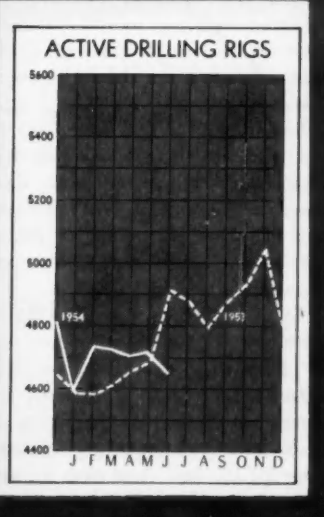
Crude Oil and Refined Products Trends

(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1952:											
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,518	6,883	269,776	3,301	120,062	1,458	120,721	1,203	53,052	643	1,037
November	6,487	7,049	267,852	3,416	129,509	1,510	116,096	1,299	53,069	624	984
December	6,634	6,952	271,928	3,361	136,028	1,509	99,582	1,302	48,706	603	1,165
1953:											
January	6,555	7,042	272,250	3,384	150,518	1,528	80,655	1,307	45,910	616	1,135
February	6,562	6,969	273,589	3,379	157,873	1,505	67,167	1,275	44,178	586	1,066
March	6,531	7,002	275,665	3,319	162,731	1,489	59,802	1,256	41,600	655	1,112
April	6,446	6,781	280,487	3,282	158,032	1,424	61,349	1,219	39,572	628	1,010
May	6,390	7,002	280,308	3,459	156,415	1,400	73,706	1,197	41,795	703	1,096
June	6,595	7,081	283,715	3,467	146,196	1,462	84,504	1,238	43,801	707	1,050
July	6,603	7,103	284,976	3,583	143,916	1,441	102,394	1,224	47,966	629	946
August	6,583	7,163	285,352	3,592	146,050	1,437	119,542	1,222	50,007	672	946
September	6,557	7,023	289,614	3,521	144,184	1,448	126,709	1,203	50,516	692	1,013
October	6,262	6,872	287,541	3,437	144,495	1,462	135,409	1,184	50,820	639	990
November	6,277	6,987	283,021	3,528	150,747	1,463	133,381	1,223	51,267	648	1,120
December	6,238	6,964	276,676	3,628	159,949	1,441	111,944	1,247	49,370	598	1,121
1954:											
January	6,240	6,947	270,811	3,431	171,704	1,550	81,044	1,271	47,474	617	1,143
February	6,379	7,068	266,918	3,476	179,950	1,545	70,390	1,241	47,119	621	1,144
March	6,507	6,923	271,867	3,375	181,297	1,458	60,270	1,168	44,249	654	1,088
April	6,615	6,811	280,310	3,404	177,006	1,374	61,721	1,140	44,362	574	950
May	6,438	6,958	279,054	3,326	173,097	1,330	72,233	1,166	46,452	716	1,044
June	6,486	6,939	278,636	3,375	165,575	1,388	85,693	1,163	50,564	676	1,062
June 1954: Change:											
In Month	+48	−19	−418	+49	−7,522	+58	+13,460	−3	+4,112	−40	+18
In Year	−109	−142	−5,079	−92	+19,379	−74	+1,189	−75	−6,763	−31	+12
Week Ended:											
7-16-54	6,298	6,969	277,748	3,405	161,786	1,440	94,794	1,128	53,355	673	979
7-17-53	6,551	7,088	279,629	3,416	142,190	1,527	94,572	1,254	47,779	617	843

Source: Data for last two months from API; prior monthly data from Bureau of Mines.





WORLD OIL'S VIEWS OF THE NEWS

HEADLINES OF THE MONTH

• Gas producers' hopes up to Ike and Congress . . . • Justice-Interior tiff denied . . . • Record bids made for Louisiana, California offshore lands . . . • Soviet exports up . . . • Ike-liked T-H change proposed . . . • Unions may merge . . . • Iranian agreement reached

Gas Case Hopes Up to Ike

The ghost of federal regulation which has long haunted the independent gas industry finally escaped from his closet last month, and it will take the President and the Congress to put him to rest.

The Federal Power Commission, reluctant and dissension-torn, took its first uneasy step toward obeying the Supreme Court's mandate in the Phillips case by freezing the wellhead price of natural gas sold by independents to interstate pipe lines.

Without waiting for the High Court's soon-to-follow rehearing denial which erased the last wan hope for judicial relief, the FPC prohibited any change in contracts in force on June 7 or since, except upon application. Sales contracts which were in effect June 7 are to be filed with the agency October 1, and no increase in these rates can be made unless it is first filed with FPC, which has the authority to suspend proposed rate hikes until a hearing is held and a decision reached.

Commissioner Seaborn L. Digby dissented bitterly, saying the FPC had exceeded its rule-making authority by fixing rates retroactively.

Industry leaders agreed—in spades: ". . . intersectional extortion has been legalized and put in official decree . . ." declared Harry W. Bass of Dallas, president of the Texas Mid-Continent Oil & Gas Association.

But by and large there was little protest from the industry, which had its say when the Phillips decision was handed down and has now decided that, as Bass put it: "Our only hope is that Congress will be sufficiently outraged to remedy this situation."

The chances of realizing that hope rests heavily on President Eisenhower, who has a plea from Sen. Lyndon B. Johnson (Dem., Texas) for creation of a study commission which would review the court's edict and make recommendations for an appropriate law clarifying the original intent of the Natural Gas Act.

What will he do? Some industry spokesmen think he will go along. They point out that he is an ardent state's rights advocate and that this is certainly a case where federal jurisdiction has been superimposed upon a strictly state function. They reason, therefore, that he will intervene.

The White House says the Chief Executive has the appeal under study. That is headway, at least, in the absence of a flat turn-down.

Oil-state legislators are solidly behind the Johnson plan. And with their more than considerable influence, the next Congress, whether it be Republican or Democratic, could parlay the commission's findings into a law which could overturn the court's ruling.

Bills to upset the court edict are pending in both the House and Senate but none has undergone hearings and all will die automatically when Congress adjourns. More measures will be introduced in the new Congress in January, but it is expected that the orderly procedure proposed by Johnson will prevail.

Johnson's commission would be composed of representatives of the gas industry, the FPC, state oil and gas agencies, and distinguished Americans. It would study the many complex problems raised by the court's decision, then draft a model bill which the President presumably would send to Congress with an appropriate message.

Tidelands Tiff Denied

Both the Justice and Interior departments refused to go along with published reports last month that they were at odds over how far Texas' rights to offshore lands extend into the Gulf.

Both denied that Justice was angry because Interior insisted on a 10½-mile limit instead of the three-mile limit said to have been fixed by Justice. A Justice spokesman said the department had not been in touch with Interior on the matter. This was backed up by two Interior officials. Acting Solicitor J. Ruel Armstrong said "no firm policy has been worked out; it's all in a state of flux." Acting Secretary of the Interior Ralph A. Tudor chimed in that, in any event, Interior supports the President's view that Texas is entitled to 10½ miles under the Tidelands Law. "It is not anticipated that any area within the three-league limit will be offered for lease by this department in connection with the proposals for leasing which are now being advertised," he declared.

Offshore Bonus Is Record

The oil industry has now paid bonuses of $66,152,432 for leases on 1,839,932 Gulf acres off Louisiana and Texas.

The Louisiana Mineral Board last month granted leases on state tracts totaling 44,807 acres for $15,356,333.

This brought the total acreage under lease off Louisiana to 1,188,469 and the total bonus to $28,352,187.

For rights off Texas the oil companies have paid $37,800,245 for 651,463 acres.

One of ten bids on one offshore tract set a Texas-Louisiana record. Shell Oil Company bid $3,250,000 for a 3750-acre tract in Block 17, East Cameron area.

Highest previous bid had been Gulf Oil Corporation's $3,065,880 last December for a 5760-acre tract off Nueces County, Texas.

Shell also bid one-sixth royalty, in contrast to the customary one-eighth. The Superior Oil Company offered $2,831,250 for the same tract, and The California bid $1,575,000—both plus one-sixth royalties.

All leases were for a primary term of three years, with annual rental for the second and third years at half the cash bonus.

California Bids Also High

Record bids for submerged lands were also made in California, where 11 companies sought rights to 1175 acres in Ventura County.

The top bid came from Richfield Oil Corporation, which offered the equivalent of 80 percent royalty on the basis of 100 barrels per day production rate per well.

Other offers: Union Oil Company, Shell Oil Company, The Superior Oil Company and Continental Oil Company, 31 percent; Standard Oil Company of California 30 percent; Signal Oil & Gas Company, 28 percent; General Petroleum Corporation, Honolulu Oil Corporation and Humble Oil

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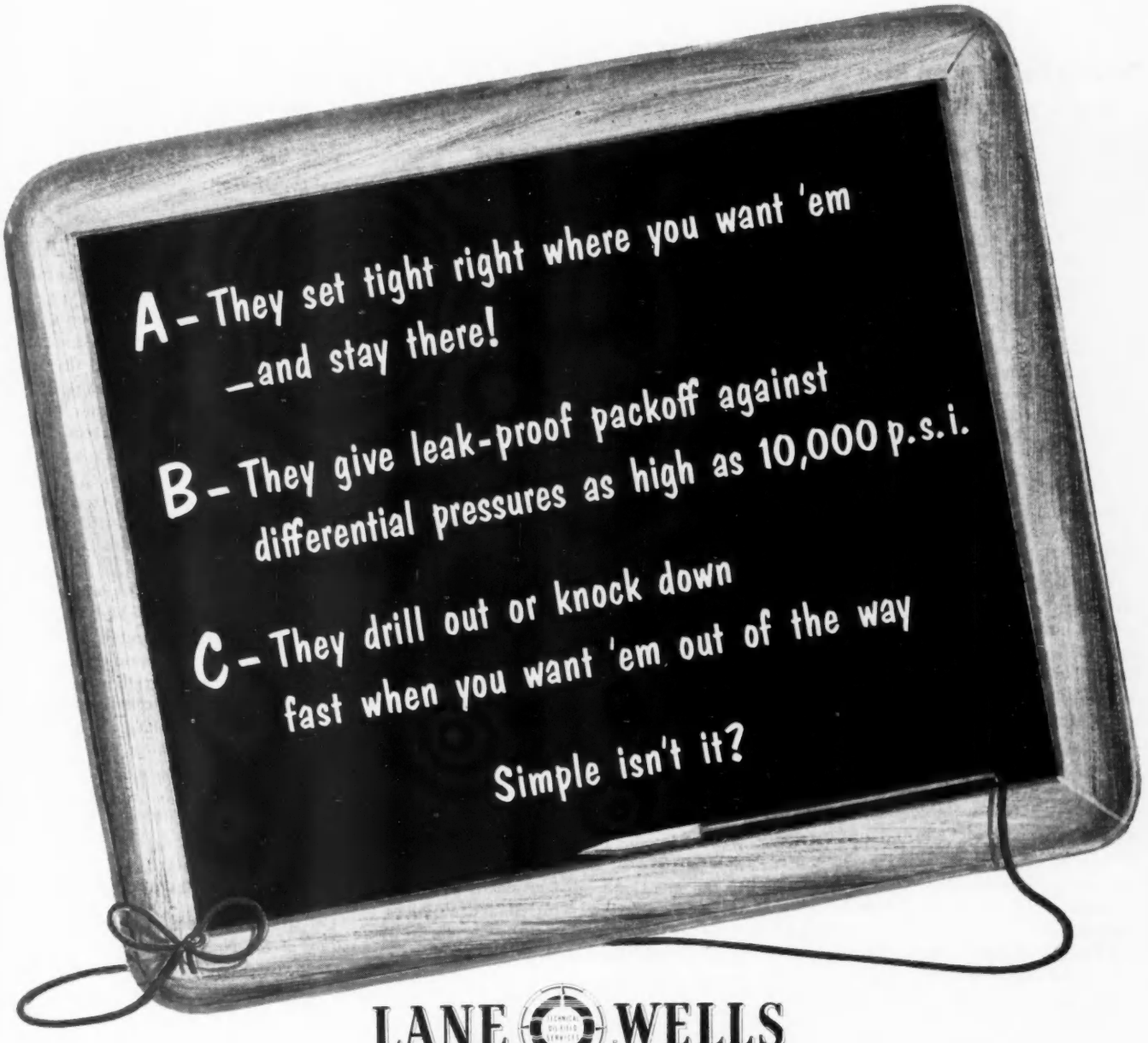
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& Refining Company, 25 percent; and Western Gulf Oil Company, 22 percent.

The high bids were attributed to the fact that the Rincon field has not been defined on the seaward side.

The proposals all said drilling would take place on man-made islands similar to the structure built by Monterey Oil Company and The Texas Company off Seal Beach.

Soviet Exports on Rise

Western oil circles, already wondering about the impact of any returning Iranian crude on already amply supplied world petroleum markets, face more competition: Russian oil.

The latest report—from Israel—has announced that the country's first shipment of Soviet crude was scheduled for delivery late in July, by way of a Finnish tanker. While this 70,000-barrel purchase gives rise to possible major political complications, Israel says it did not figure in discussions now under way with Anglo-Iranian Oil Company and Royal Dutch Shell Group for a cut in prices of crude sales in Israel.

According to Israel, there are no objections to the refining of Soviet crude in the British-owned Consolidated Refineries, Ltd., at Haifa.

Free world crude producers long have had world oil trade pretty much to themselves, but this year Russia will export about 36 million barrels of crude to Finland, Iceland, Argentina, Italy, Belgium, Greece, Israel, and Sweden, if present trade pacts are fulfilled. These exports amount to between 1 and 2 percent of world petroleum trade. And they equal more than 100 percent increase in USSR exports from 1953 to indicate a possible trend toward carving a greater niche in the future.

Russia, in 1953, averaged a daily production of a million barrels. The Kremlin controls all satellite oil industries whose annual total production ranges upwards of 40 million barrels. Thus, Russia's 1954 commitments, if met, will siphon off less than 8.5 percent of the oil production it controls.

This Russian effort points to many possibilities, but no conclusions can be drawn because of the almost impenetrable secrecy which shrouds the Red ring. The West is wondering whether the Kremlin is trading off oil it considers expendable for goods to raise the standard of living of the Russian people. Or whether the aim is to establish a foothold in free nations, through organization of now-lacking sales and distribution agencies, which could abet the announced Red policies through fifth-column activities. Or whether the Red military is served so well by satellite oil that Russia itself has no need for all of its domestic production due to the absence of any but negligible consumer demand for products.

At any rate, as matters stand now, any Russian effort to gain a major foothold in world oil trade is confronted by two major obstacles:

- A lack of sales and distribution points in the West.
- Free world's inherent doubt, resulting from countless pacts and promises flouted by the USSR, that any dependable source of crude could result from an agreement with Russia.

T-H Change Proposed

Over-all revision of the Taft-Hartley Law has been considered dead for this session of the Congress, but there was a belated attempt late last month to push through one of the two changes favored by the President.

House Labor Committee Chairman McConnell (R., Penn.) introduced a bill dealing with a provision of the law that says workers striking for money gains may not vote in NLRB-supervised representation elections. Unions call this a union-busting feature, claim that an employer whose workers strike for more money could hire replacements for the strikers and then ask the National Labor Relations Board for an election decertifying the election. The replacements might then vote against the union.

The President has asked, and the McConnell bill provides, that this provision be altered so as to prohibit an employer from getting a decertification election for a year after a start of an economic strike and prohibit any other union from getting an election for four months after the strike starts.

The other change which has been wanted by the President would make employers, as well as union officials, subject to the non-Communist affidavits provision of the present law. This change would be taken care of in an anti-subversive bill being studied last month by the House and Senate Judiciary Committee.

Bargaining Not Necessary

The National Labor Relations Board got into the public prints a second time last month when it ruled, in effect, that the law doesn't require a man to take his hat off to somebody who's trying to club him over the head.

Companies don't have to bargain with unions that are their competitors in business, NLRB decreed in a dispute, first of its kind, between Bausch & Lomb Optical Company of St. Louis and the CIO Optical and Instrument Workers.

The board held that a union "cannot perform its statutory function as a bargaining representative if simultaneously it is an immediate business competitor of the particular employer whose employes it purports to represent." The board made it clear, however, that it was in no way condemning the spreading practice of unions investing in business.

Union Merger Seems Likely

The Oil Workers International Union may become a much more potent bargaining agency this month despite the near-failure of its campaign to date to join with independents in forming a new organization.

Rank and file committees of Jack Knight's CIO-affiliated OWIU, which claims to represent 130,000 industry workers, will meet August 9 in Washington with representatives of the 70,000-member CIO United Coke, Gas and Chemical Workers to discuss a merger.

Knight's effort to bring about a marriage of the CIO affiliates does not mean, however, that he has abandoned the "Philadelphia plan" for merging with independent organizations to form a new million-man Oil and Chemical Workers Union. On the contrary, the merger to be discussed this month would give Knight a new talking point to rally the independents under his banner. And that the banner would indeed be Knight's there seems little doubt.

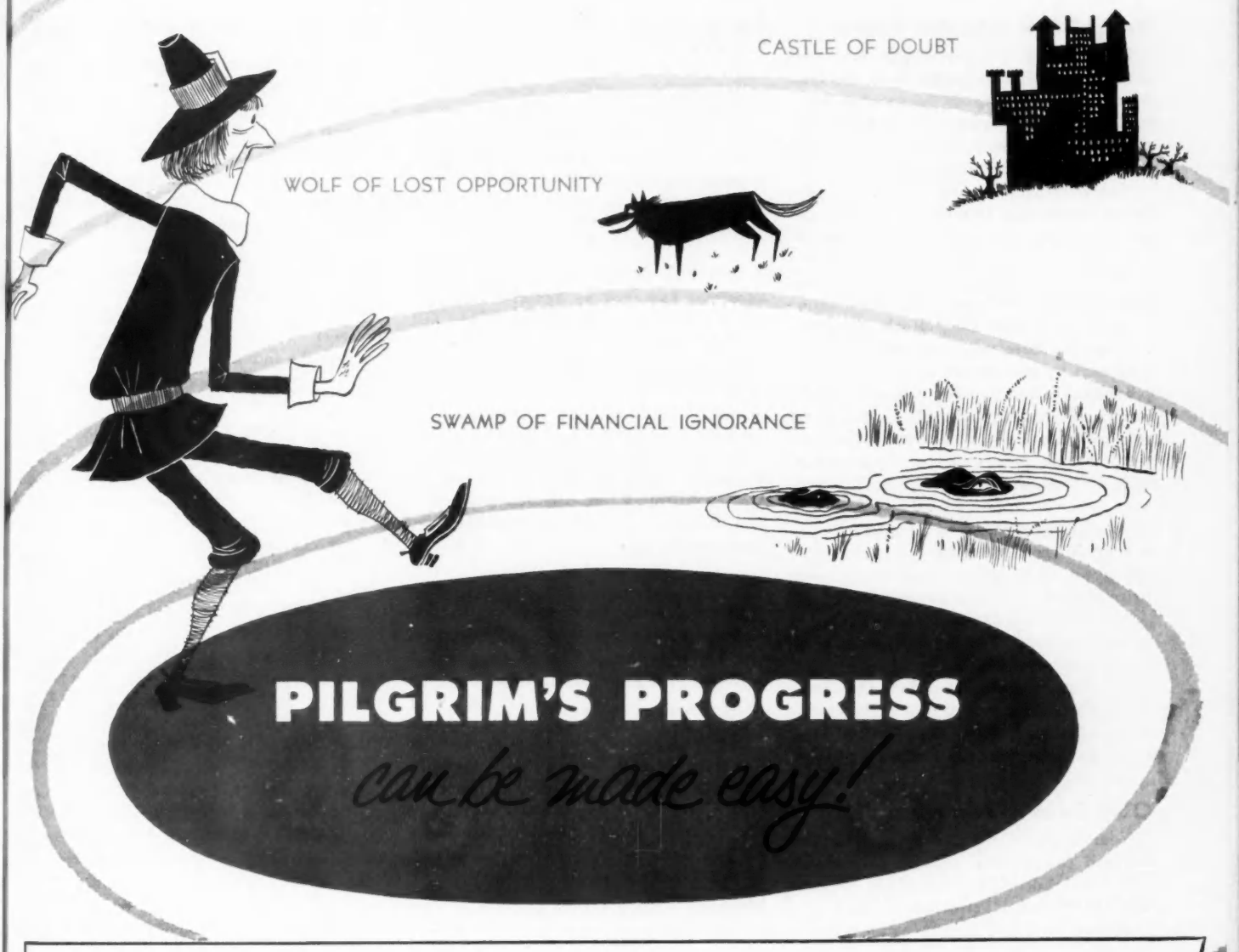
Two years ago there was an effort to merge OWIU and the United Gas, Coke and Chemical Workers, but it was beaten by the latter group's president, Martin Wagner, who correctly figured that the president of such a combine would be Knight, because of his larger membership. Wagner has now been succeeded by Elwood Swisher, who has indicated his willingness to step aside in the event the merger is realized.

Oil's Safety Record Improves

Oil workers employed by member companies of the National Safety Council had a safer year in 1953, as did most employes in other industries.

Thirty-four of the 40 basic industry classifications listed by the Council reduced their frequency rates and 24 reduced severity rates. The average accident frequency rate for employes in all industries submitting company reports to the Council, based on the number of disabling injuries per million man-hours, was 7.44 in 1953, a reduction of 11 percent from the year before.

Petroleum's frequency rate was 9.00, a commendable 7 percent drop from the previous year. Oil's severity record was worse, going up 4 percent to 1.08, compared with .83 for all industries reporting to the Council.



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Deep Rock Accepts Offer

Deep Rock Oil Corporation directors accepted a $27 million offer from General American Oil Company to purchase virtually all the former's producing leases and royalties, its refinery, a crude line, and marketing physical properties.

The offering price was put at $22 million in cash plus 100,000 shares of General American common. Based on the recent $50 per share market price of the stock it would have a value of $5 million, making a total consideration of $27 million.

W. H. Garbade, Deep Rock president, said the purchase proposal, which must be approved by stockholders September 7, provides a plan whereby General American would lease back to Deep Rock the refinery, pipe line and marketing properties for eight years at an annual rental of $250,000. In addition, Deep Rock would have first call on crude produced from the properties sold to General American and it would also have preference in purchasing the properties under lease at the same price offered by another prospective buyer.

Deep Rock would retain its undeveloped acreage and would also retain its interest in the Hugoton Plains Gas & Oil Company, American Independent Oil Company, the Many Islands gas fields of Alberta, and the F. Kirk Johnson producing leases in Coke County, Texas.

OGD Seeks Free Help

Four industry men to serve with the Oil and Gas division without government pay are needed, Director Hugh Stewart told the National Petroleum Council.

Stewart said the agency had wanted a director, 2 assistant directors and 10 specialists, all on the government payroll. But Congress whacked $50,000 off OGD's $300,000 budget request, making it impossible to hire all the men needed. Hence, OGD plans to hire three more specialists to supplement the four-man specialist staff, and to augment these with industry men serving without pay.

Court Gas Ruling Asked

The Supreme Court has been asked to rule on whether a state minimum price applies to gas that has been processed.

The case was brought by Natural Gas Pipe Line Company after an Oklahoma court ruled it must pay 7 cents per mcf state minimum on dehydrated gas it buys from Panoma Corporation. After buying the gas from Panoma, the company routes it through its own compressor station and then back through Panoma facilities, where it is stripped before being piped to Midwest markets.

Natural claims it is not actually buying wellhead natural gas but, in effect, purchasing processed gas. The Oklahoma State Commission ruled otherwise, and has been upheld by the state court.

In brief . . .

FPC will hold an oral re-argument in Washington Sept. 23 at the request of El Paso Natural Gas Company for a $15,287,000 increase in wholesale rates. The increase has been in effect, subject to refund, since January, 1953.

•

Oil's 27.5 percent depletion tax allowance was approved by Senate-House conferees working on the omnibus tax bill. The depletion rate was raised to 23 percent for uranium and about 30 other minerals.

•

At the request of OGD the National Petroleum Council will make a study of U. S. availability and production of crude and natural gas liquids and of reserve production capacity.

•

Premier Borg Olivier of Malta has signed deeds on behalf of the Malta government whereby exploration licenses will be issued to D'Arcy Exploration Company.

•

Frederick Stueck, a St. Louis Republican was sworn in as a Federal Power Commissioner to succeed Dale Doty, a Democrat. Stueck, 48, an attorney, was chairman of the Missouri Public Service Commission for two years before becoming an official of the Transit Casualty Company of St. Louis.

•

Recent foreign aid authorizations reported by the Foreign Operations Administration total $5,187,000 worth of petroleum items.

•

A number of nationalized Austrian enterprises, oil among them, will soon be given back to their original owners, it is being predicted in Vienna.

•

The use of fuel oil by electric utility power companies declined and the use of coal and natural gas gained during the 12-month period extending through May, according to the FPC. Consumption was 116,555,455 tons of coal, 75,924,803 barrels of fuel oil, and 1,088,589,223,000 cubic feet of gas. This was an increase of 5.8 percent for coal and 14.1 percent for gas, but a decrease of 3.9 percent for oil, compared with the previous 12 months.

•

Objections from the coal industry killed for this session of the Congress a bill which would have granted condemnation rights to natural gas companies for underground storage facilities.

Iranian Agreement Reached

An agreement in principle has been reached between Iran and representatives of eight international oil companies to put Iranian crude back on the world market.

Finance Minister Ali Amini indicated a pact would be completed before August 1. Thus, the negotiating stage of the initial phase of this perplexing issue has ended.

To describe any agreement reached between the companies' negotiating committee and Iran Finance Minister Amini as a lasting settlement would be misleading, however. The plan for the consortium to operate the industry that has been idle for 3½ years must win approval in the Majlis, where there has been mounting opposition to any plan that would mean foreign operation of the oil industry.

Approval must also be won in other Middle East nations whose rates of production would have to be cut to permit return of Iranian oil to markets already amply supplied. The consortium plan, in effect, guarantees a specific volume of Iranian oil will be produced and marketed, a type of arrangement which could irk other oversensitive Middle East rulers. Without approval for cutbacks in other countries, the consortium plan would fail.

In the consortium are Anglo-Iranian Oil Company with a 40 percent share in the group; five U. S. companies: Standard Oil Company (N. J.), Socony-Vacuum Oil Company, Standard Oil Company of California, Gulf Oil Corporation and The Texas Company with an aggregate interest of 40 percent; Royal Dutch-Shell with a 14 percent interest, and Compagnie Francaise des Petroles with a 6 percent interest.

The consortium's plan is for output of 250,000 barrels daily from Iran during the first year of operation, with increases scheduled to reach almost 525,000-plus barrels daily in three years. Iran would receive about 80 cents a barrel from crude oil sales.

Once Iran is satisfied with a consortium operating agreement, the eight-company group faces the complicated problem of establishing markets and scheduling production curtailments elsewhere to make room for Iranian oil. The eight companies produce more than half the worlds' oil and control all Middle East production, except a trickle from the Neutral Zone. Regardless of the close-knit control of the world's oil, consortium members may face difficulty in effecting cutbacks in some Middle Eastern countries.

Also the five American members of the group will have to tread on a tight rope in the arrangements of cutbacks, marketing quotas and the like. The five companies have U. S. anti-trust immunity to participate in the consortium but the immunity does not cover any violation of U. S. laws. Such joint action by groups is called a cartel. Action as proposed by the consortium quite likely would be closer to a vio-

lation of U. S. anti-trust laws than any of the business practices normally conducted by the U. S. companies that resulted in the Justice Department cartel charges in 1952.

Payments to Iran would be in sterling, since nearly all of its production would be sold in Eastern Hemisphere markets. This would mean additional sterling oil would be in competition with Arabian American Oil Company's dollar-produced Saudi Arabian oil. It would also mean a complete freeze out in Europe and Asia for Neutral Zone oil produced by American Independent Oil Company and Pacific Western Oil Corporation. All other Middle East oil is sterling produced though there is a small percentage of dollar costs in these sterling areas. It is to the extent of the dollar cost in sterling oil that American oil companies can compete in European markets and repatriate profits in dollars.

Free convertibility of dollars with stable European soft currencies would remove the currency exchange problems that will be incident to Iranian oil operations through the consortium. U. S. companies will be selling 40 percent of the oil produced mostly in soft currency markets. These companies will be paid in sterling or other soft currencies, and the British Treasury will be required to make provisions for the conversion of these currencies into dollars.

There have been several recent proposals from Western European nations for a return to free convertibility but refusal by Great Britain has held up such plans. There have been indications lately, however, that the United Kingdom is reconsidering its position and sometime late this year would be agreeable to placing the pound sterling on a free convertible basis with all other stable currencies.

Free convertibility would give American oil companies selling to sterling markets a substantial boost and would also be of direct benefit to American oil equipment manufacturers whose foreign sales have been curtailed by the need of oil companies operating abroad to purchase as much equipment as possible with soft currencies. Free convertibility would be particularly beneficial to Arabian American, which has experienced considerable difficulty in using all of the soft currencies, accumulated in its large volume sales to the Eastern Hemisphere, and would make it possible for the company to compete equally with the sterling producers of the Middle East.

Should free convertibility come later this year, ironically it may be a few months late to be of much help to Arabian American. The company has been setting production records in 1954, but considerable uncertainty lies ahead for the company since the tanker agreement was reached between Saudi Arabian and Greek-shipowner, A. S. Onassis. The pact gives Onassis an eventual monopoly over transportation of Saudi Arabian oil and puts Aramco at a considerable disadvantage.

The basis for rates to be charged by Onassis are based above the usual tankship charter rates and with monopoly in shipments, many nations which have bought Saudi Arabian oil and shipped in tankers of their own choosing to take advantage of rate differentials and foreign exchange savings will be eliminated as customers. The result would make Arabian crude a premium oil at a time when competition for crude oil markets is at the greatest peak since the late '30's.

Texas Allowable Again Cut

Texas took another reluctant right-hand turn on its crude production valve last month, but not without a long look around at what others are doing to ease the surplus.

The Texas Railroad Commission trimmed the August allowable by 121,642 barrels per day from the average of 2,842,746 barrels per day in the week ended July 10, bringing the total cut since April to nearly 400,000 barrels per day.

The new quota of 2,721,104 barrels per day is based on a 15-day pattern for most of the state. Shell Oil Company recommended a continuing 16-day pattern, but the others followed the lead of Humble Oil & Refining Company in urging the reduction to 15 days.

The process of reducing the allowable was accompanied by some pointed demands that other areas and branches of the industry cooperate to ease the situation. John Edwards of The Texas Company noted under questioning that all producing states except Texas and those in the Rocky Mountain area continue to fill a greater share of U. S. market demand than their respective reserves would justify.

Chairman Ernest O. Thompson had a few words to say about refineries built for security purposes on a fast tax write-off basis, at the federal government's request.

"These refineries were put on stream to test," he observed. "They've been reluctant to take them off, although they were built for use on a standby basis."

The commission plans to ask all companies for a report by next month on nominations to buy in each state, on allowables and on actual production.

Gas Expenditure Estimated

The gas utility and pipe line industries will spend $3.9 billion on new construction during the four years, 1954-57, it was estimated last month by the American Gas Association. This compares with actual expenditures of about $5.08 billion for expansion in 1950-53.

Expenditures of the industry in 1953 for new facilities aggregated $1.35 billion, the second highest total in gas industry history. Last year was the fourth consecutive year in which new construction expenditures exceeded $1 billion.

Total expenditures for new construction and expansion of present facilities for 1954 are estimated to be about $1.2 billion, with expenditures of $1.15 billion for 1955. Industry estimates for 1956 and 1957 are placed at about $¾ billion each year.

These estimates may prove conservative, since many companies tend to underestimate construction projects for the more remote years. Although in the post-war years, the ratio between available supply and demand for natural gas has gradually lessened there are many factors indicating further growth of demand for gas. More large pipe line projects will be needed to supply industrial and population growth. Though construction expenditures may decline, the reduction from current levels may be more moderate and gradual than indicated in the present estimates.

About 90 percent of the estimated construction expenditures for the next four years, or a total of about $3.6 billion, will be devoted to expansion of the nation's natural gas systems. About $1.71 billion will be spent on natural gas transmission lines and utilities distributing natural gas will spend $1.33 billion for expanded distribution facilities. Natural gas construction expenditures in 1953 totaled $1.25 billion, and it is anticipated that about $1.09 billion will go for natural gas construction in 1954.

For the whole gas utility and pipe line industries, transmission expenditures will amount to $1.72 billion from 1954 through 1957. About $1.6 billion will be spent on all types of distribution and $327 million will be spent in expanding underground storage facilities in the next four years. The distribution expenditures for the 1954-1957 period are greater than in comparable period from 1950-53, when about $1.4 billion went into expanded distribution facilities.

Ike Enters Tanker Dispute

The administration's determination to prevent government competition with private enterprise wherever possible was again evidenced last month when President Eisenhower aired his views on the hotly debated matter of tankers for the military.

The Senate has passed a bill providing for long-time charter of privately-built tankers, but the House changed it to call for government construction of 20 such vessels at a cost of approximately $150 million.

It appeared that the Senate version would win out after President Eisenhower declared he favors private construction with long-term charter arrangements.

U. S. Wells Completed in June and First Six Months, 1954

STATE or DISTRICT	NEW WELLS COMPLETED AND FOOTAGE DRILLED																		
								TOTAL NEW WELLS			Total Footage June, 1954	DETAILS FOR JANUARY-JUNE					Rigs in Operation		
												New wells			Footage				
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water disposal	June 1954	May 1954	June 1953		1954	1953	Percent Diff.	1954	1953	June 31, 1954	May 31, 1954	June 31, 1953
Alabama				6				6	11	10	32,068	43	49	— 12.3	220,200	256,620	7	5	7
Arizona				6				6		1	20,654	8	5	+ 60.0	30,774	15,437	3	1	2
Arkansas	25			23				48	37	34	176,580	269	206	+ 30.6	969,140	733,858	30	31	40
California	123		2	65				190	198	254	852,805	1274	1,299	— 1.9	5,752,327	5,545,959	198	225	263
Colorado	39	1	8	70				118	113	70	639,353	630	288	+118.8	3,494,780	1,402,984	73	77	53
Florida				2				2	2	5	7,697	15	18	— 16.7	97,343	95,165	3	2	5
Georgia												3	3	0.0	11,068	7,808	3	3	2
Idaho										1			2	0.0		19,488	1		
Illinois	140		1	107				248	285	169	818,360	1388	883	+ 57.2	3,778,428	2,191,622	258	253	201
Indiana	27		3	36				66	59	96	96,438	390	585	— 33.3	594,670	1,036,164	124	124	197
Kansas	167		35	138			2	342	399	348	1,203,063	2028	2,357	— 14.0	7,085,677	8,148,959	405	409	455
Kentucky	49		16	44	1			110	127	110	211,366	672	531	+ 26.8	1,282,991	1,057,990	106	96	96
Louisiana	202	25	31	90			1	349	287	211	2,286,147	1685	1,179	+ 43.0	10,737,361	8,450,474	268	295	233
North Louisiana	115	10	15	27				167	148	102	481,906	863	501	+ 72.3	2,533,530	1,822,890	53	50	55
South Louisiana	87	15	16	63			1	182	139	109	1,804,241	822	678	+ 21.2	8,203,831	6,627,584	215	245	178
Maryland													2	0.0		8,198	3	3	3
Michigan	18			28				46	50	45	142,767	280	270	+ 3.7	748,257	729,688	108	100	84
Mississippi	12	1	1	26				40	35	36	285,660	193	183	+ 5.5	1,347,278	1,256,545	40	36	40
Missouri									1	1		6	13	— 53.9	8,133	12,521	1		2
Montana	18		1	17				36	21	42	121,166	182	191	— 4.7	704,559	857,315	30	37	67
Nebraska	25		3	17				45	16	42	255,102	183	164	+ 11.6	1,017,438	856,473	23	23	25
Nevada	1			5				6		1	27,185	8	6	+ 33.3	40,095	9,050	3	3	
New Mexico	35	1	32	19				87	89	135	393,652	543	698	— 22.2	2,999,354	3,933,340	135	116	204
New York	22				15			37	45	77	84,912	315	430	— 26.8	472,362	601,194	80	78	125
North Dakota	16			10				26	15	21	179,205	123	118	+ 4.2	862,737	937,795	39	32	28
Ohio	38		22	22				82	114	79	161,664	514	471	+ 9.1	1,003,641	989,574	186	187	177
Oklahoma	327	6	15	162	2		1	513	675	587	1,879,815	4034	3,487	+ 15.7	13,762,895	12,376,602	742	729	643
Pennsylvania	34		10	9	26	5		84	96	140	157,467	570	779	— 26.8	998,708	1,359,661	184	213	282
South Dakota	1			3				4		2	35,287	14	5	+180.0	79,247	25,499	2	4	5
Texas	837	39	54	581	2			1513	1535	1451	6,745,424	8847	8,407	+ 5.2	40,375,820	38,155,381	1329	1372	1376
Dist. 1: South Central	46			33				79	100	84	261,029	505	420	+ 20.2	1,732,566	1,365,856	37	41	36
Dist. 2: Middle Gulf	21	4	5	26				56	59	74	326,987	408	401	+ 1.7	2,418,558	2,449,315	40	53	48
Dist. 3: Upper Gulf	70	15	1	62				148	172	142	1,056,595	855	817	+ 4.7	5,881,465	5,479,370	139	146	143
Dist. 4: Lower Gulf-S.W.	46	11	4	46				107	123	145	574,662	740	931	— 20.5	3,851,697	5,318,985	79	87	110
Dist. 5: East Central	8	1		28				37	21	24	130,555	137	162	— 15.4	502,042	627,464	17	16	15
Dist. 6: Northeast	23	2	11	27				63	73	32	356,187	360	237	+ 51.9	2,162,924	1,384,533	52	43	59
Dist. 7-B: North Central	98		1	81				180	182	269	613,497	1302	1,542	— 15.6	4,314,128	4,992,654	134	142	138
Dist. 7-C: West Central	57	1	2	60				120	104	108	632,689	642	705	— 8.9	3,263,397	3,474,329	139	143	117
Dist. 8: West	175			43				218	313	179	1,257,215	1377	1,096	+ 25.6	8,278,461	6,221,435	363	355	353
Dist. 9: North	241	3	6	162	2			414	327	358	1,230,153	2026	1,863	+ 8.7	6,337,146	6,135,100	232	252	292
Dist. 10: Panhandle	52	2	24	13				91	61	36	305,855	495	233	+112.4	1,633,436	706,340	97	94	65
Utah	1		1	4				6	1	10	12,639	24	42	— 42.9	121,086	252,039	22	19	14
Washington																	1	1	1
West Virginia	7		28	9				44	44	56	113,560	246	305	— 19.4	683,776	855,453	160	159	200
Wyoming	72		1	44				117	70	75	597,120	643	328	+ 96.0	3,352,708	1,637,676	89	83	105
Total United States	2236	73	264	1543	46	5	4	4171	4325	4109	17,536,556	25,130	23,304	+ 7.8	102,632,853	93,816,532	4656	4716	4935
Total Western Canada	57		6	61				124	123	166	491,292	906	933	— 3.0	3,732,059	3,931,608	137	116	168

Completions at New High

25,130 for first six months of 1954 most ever recorded in first half of any year.

AT THE END of the year's first six months, wells drilled stood at 25,130, the highest level ever reached in the initial half of any year. The previous peak had been the 23,304 recorded in the January-June period of last year, which has now been topped by 7.8 percent.

It appears quite likely that the last six months will see this activity duplicated, giving the year a grand total of more than 50,000 wells completed and the distinction of becoming the first year to reach the 50,000-well level.

The amount of footage drilled this year has made an even more impressive record than the number of wells. A total of 102,632,853 feet was drilled in six months and that represented a gain of 9.4 percent, or almost nine million feet, over the 93,816,532 penetrated in last year's comparable period. Not only was this the first time that as many as 100 million feet were drilled in the first half of a year, but it was not until 1947 that as much footage was recorded in an entire year. The one exception was in 1937 when 105 million feet were drilled.

The average depth of each new well drilled this year was 4084 feet, while a year earlier the average had been 4026 feet. When all the year's operations have been counted, footage drilled should total well above 200 million feet. The present record is 196 million drilled in 1953.

Four of the five leading drilling states experienced increased activity this year over last. Texas, the No. 1 state, was the locale of 8847 new wells this year and showed a gain of 5.2 percent over last year's 8407. Oklahoma's operations were boosted 15.7 percent from last year's 3487 wells to 4034, and firmly implanted that state in No. 2 drilling spot in the nation.

The one decline in the top five states occurred in Kansas where wells drilled dropped 14 percent from 2357 last year to 2028. However, Kansas maintained its No. 3 position among drilling states.

Gamma Ray Exploration Comes of Age

Oil accumulations may be outlined by detecting surface radiation associated with buried hydrocarbons. The method is valuable for use in conjunction with geological and geophysical work

By **DAVID S. LOBDELL,** President; **E. F. BUCKLEY,** Chief Engineer, and
DR. JOHN W. MERRITT, Consultant, Dell Surveys, Inc., Dallas

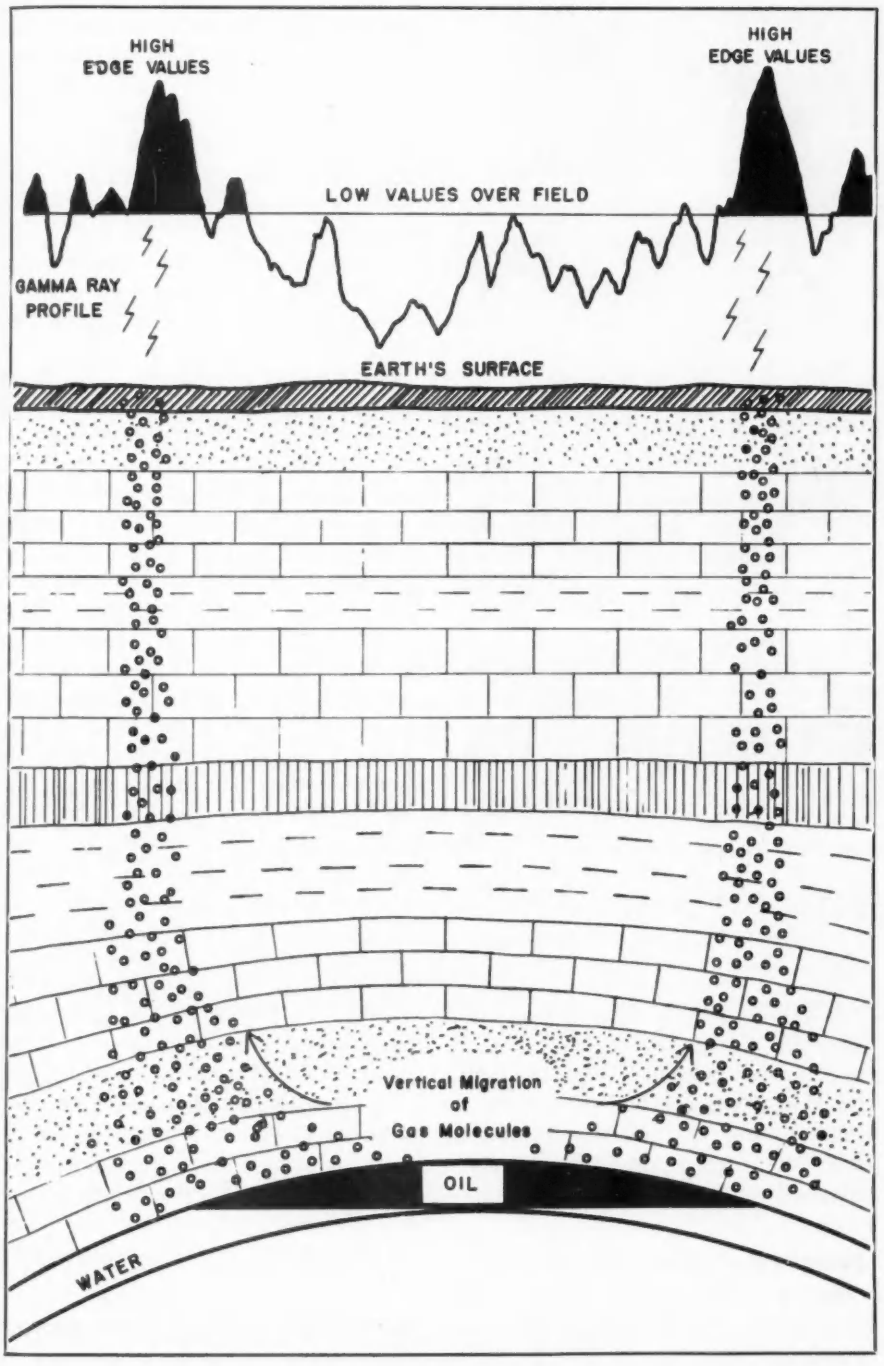

Fig. 1—Typical gamma ray profile in relation to an oil reservoir.

As a result of years of experimental trial and error observations, greatly aided by the development of precise instrumentation and mobile equipment, the science of radioactive surveying for oil and gas has "come of age."

Since the earliest days of oil exploration, scientists have been searching for surface indications of oil reservoirs. Among the oldest clues were oil and gas seeps from which many good oil fields were developed. Later, significant differences in soil and vegetation patterns were noted over certain oil fields, especially over salt domes in the Gulf Coast area.

This led the geochemists to believe that oil and gas escape not only from shallow beds in the form of seeps, but that some of the lighter hydrocarbon fractions (in the form of gas molecules) escape vertically to the surface through thousands of feet of sediments.

This theory appears to have been confirmed by chemically testing the cuttings from a large number of wells on and adjacent to producing oil fields to determine the saturation, from top to bottom, of light hydrocarbons. These studies developed a significant pattern. Some phenomenon, possibly chemical, apparently releases a concentration of hydrocarbon molecules at the margins of production from which point they migrate vertically to the surface (Figure 1).

This vertical movement sets up an accumulation pattern of hydrocarbons in the surface soil, which takes the form of a marginal band roughly following the shape and size of the subsurface reservoir.

For a good many years efforts were made to map geochemical patterns over oil fields by testing for soil hydrocarbons. However, the instabil-

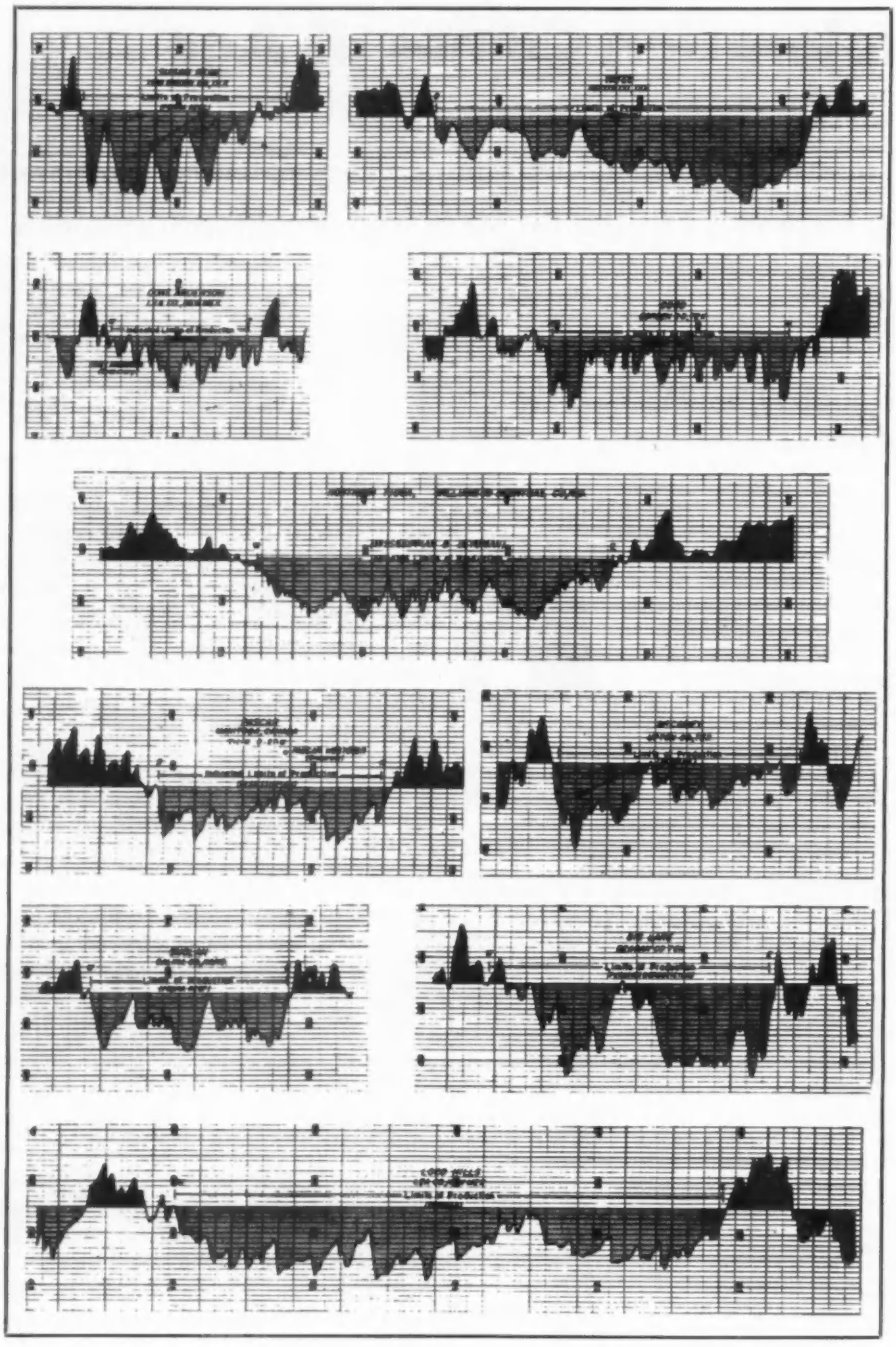

Fig. 2—Typical gamma ray profiles across producing oil fields. (Recorded on tape at 10 miles per hour).

ity of these chemical patterns which are influenced by moisture, heat, barometric pressure and other climatic conditions was so great that the industry, after extensive tests, largely abandoned soil analysis.

Surface Gamma Ray Surveys. Growing out of the experiments in soil analysis came the new science of surface Gamma Ray surveying. This method, which has been brought to successful development in the past five years, is closely allied to geochemistry in that it appears to measure and outline a radiation pattern similar to the hydrocarbon pattern in the surface soil. It is, however, largely free from major instabilities which plagued soil analysis.

Surface Radiation. Gamma rays are everywhere; one can shield out a part of but never all of them. These rays are from three sources, (1) the radioactive material in the surface of the earth, (2) the radon in the air which emanates from the earth, and (3) the cosmic rays from outer space.

The sum of these rays forms an intensity of gamma radiation that varies over the surface of the earth from about .08 to .8 of a roentgen per year. In the term generally used for radiation measurements, roentgen per hour, this would be (.08 to .8) R ÷ (24 × 365) or 9.1 to 91 micro or millionth roentgen per hour. Most of our measurements have been in the range of 10,220 micro roentgen per hour.

Instrumentation Factors. The instrument requirements for making gamma ray surveys are extreme. The necessary limits of stability and accuracy are dictated by two factors which are generally known to exist but fully understood by a relative few. These factors are the very low level of radiation in which accurate measurements are to be made and the variable nature of the radiation proper.

The low level of measurement may be indicated as follows. Good radiation equipment suitable for field use is commercially available that may have a range as low as .5 milli roentgen per hour and the accuracy may be as good as plus or minus 10 percent. Field intensities and conditions dictate that an instrument that will be usable for field measurements for oil exploration must measure an intensity of radiation only one-fiftieth of the above amount and do so with an accuracy equal to or better than plus or minus 1 percent. It must have a resolution of .1 microroentgen or better. It is also necessary that such measurements must be made in a sufficiently short time to be economically practical.

The variable nature of the radiation proper stems from the random way in which radio-active substances behave. The so-called shot effect and the laws of probability on random occurrences dictate that a count of 100 will provide an average accuracy of plus or minus 10 percent but that a count of 10,000 is necessary to obtain an accuracy of plus or minus 1 percent. The difficulty lies in getting a sufficiently large sample in a field of such low intensity within practicable time limits.

Limitations to Good Instrumentation. In continuously moving equipment the rate of travel is limited by

the quantity of radiation the instrument can pick up and the time constant of the instrument. The quantity of radiation and time constant must be such that the required statistical accuracy of the recording may be attained in a distance X. This distance in some areas may be quite short. In some instances edge effects may be sharply shown in a surface distance of 150 to 200 feet. At 20 miles per hour the counting rate has to be in the neighborhood of 1600 counts per second.

A major requirement of a field instrument is stability. For satisfactory measurements the drift should not exceed 1 percent in 24 hours. This degree of freedom from drift may be attained with relative ease in a laboratory set up with unlimited power available but is extremely difficult in field equipment where the only power source may be batteries that are continuously variable through load and because of temperature changes. Temperature also has its effect on practically all components of an electronic circuit. The problem of instrumentation is severe but it, like Mt. Everest, has been scaled.

Radiation surveys have one notable characteristic. With equipment sufficiently stable and accurate the radiation patterns can be consistently duplicated under all normal weather conditions (excluding rain, snow and weather fronts).

By making a log of varying intensities of soil radiation in straight lines across a producing oil field, a surface pattern is created which closely adheres to the outline of the subsurface reservoir.

The survey normally picks up an oil field by showing a greater radiation intensity as it crosses the edges of the pool. Figure 2 shows typical radiation cross-sections showing the high intensity over the edges of production and the low level of radiation over the main body of the reservoir of several developed oil fields. Figure 3 shows a like pattern with marginal highs and productive lows as outlined in detail with the hand instrument.

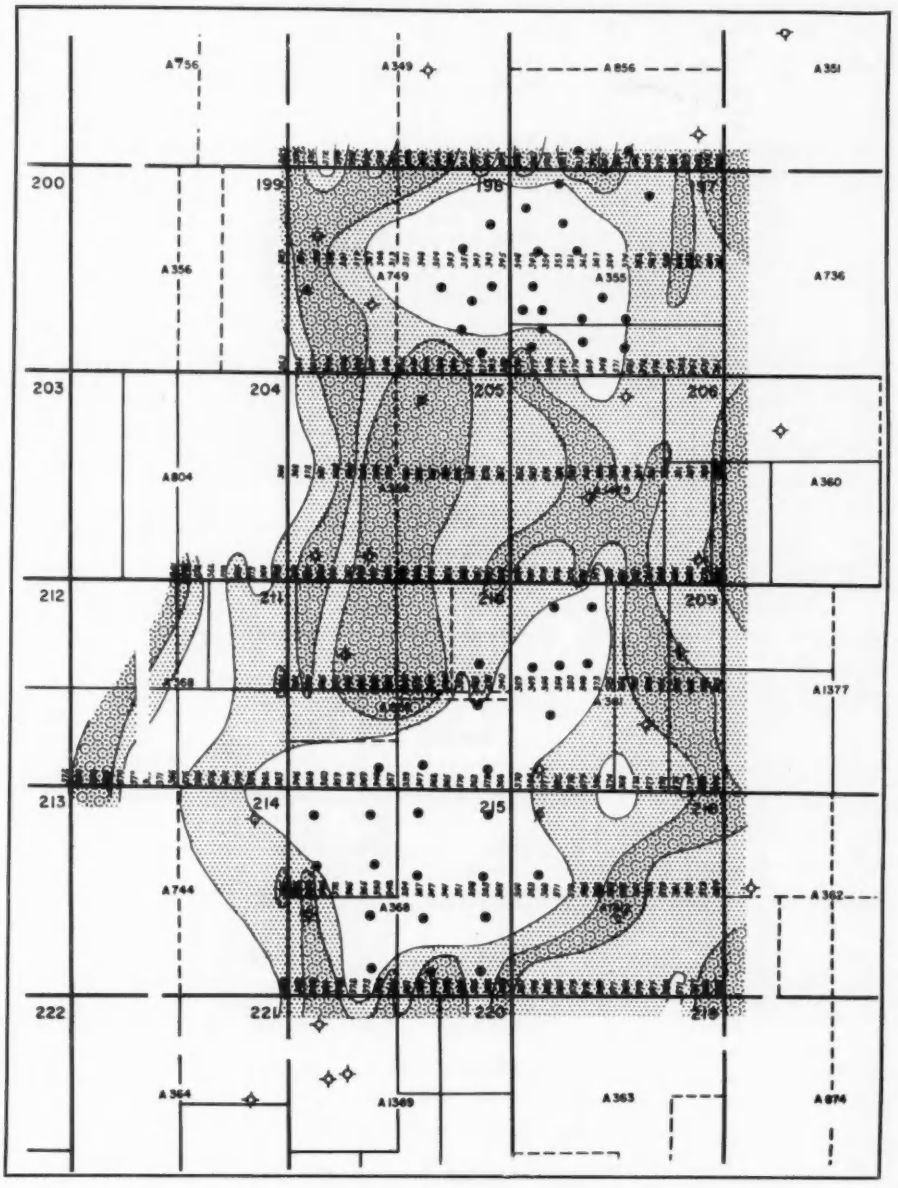

Fig. 3—Gamma ray map made with portable hand equipment.

Detail by Hand Instruments. A field crew consists of a geologist and two assistants to carry the hand equipment. This equipment weighs approximately 70 pounds. Readings of the average intensity at each station are taken over a time of about 100 seconds, usually sufficient for representative data. The spacing of stations and lines of stations will, naturally, vary with the problem and the probable size of the producing area anticipated.

While working with the hand instrument on detail surveys it became increasingly apparent that the best interpretation of possible favorable anomalies requires a thorough knowledge of normal background (nonproductive) pattern. Attempts were made to acquire this information by running long profiles in background areas. This method, however, proved slow and unnecessarily expensive. Accordingly, rapid moving mobile equipment has been developed by the use of which not only large background areas may be surveyed in a minimum of time but also large productive fields (Figure 4) could be mapped for comparative purposes.

Mobile Equipment. During the past two years rapid mobile reconnaissance equipment mounted in four-wheel-drive trucks has been developed. This extremely sensitive equipment registers through a recorder, the chart of which is driven by speedometer cable. On this chart gamma ray intensity values are recorded in

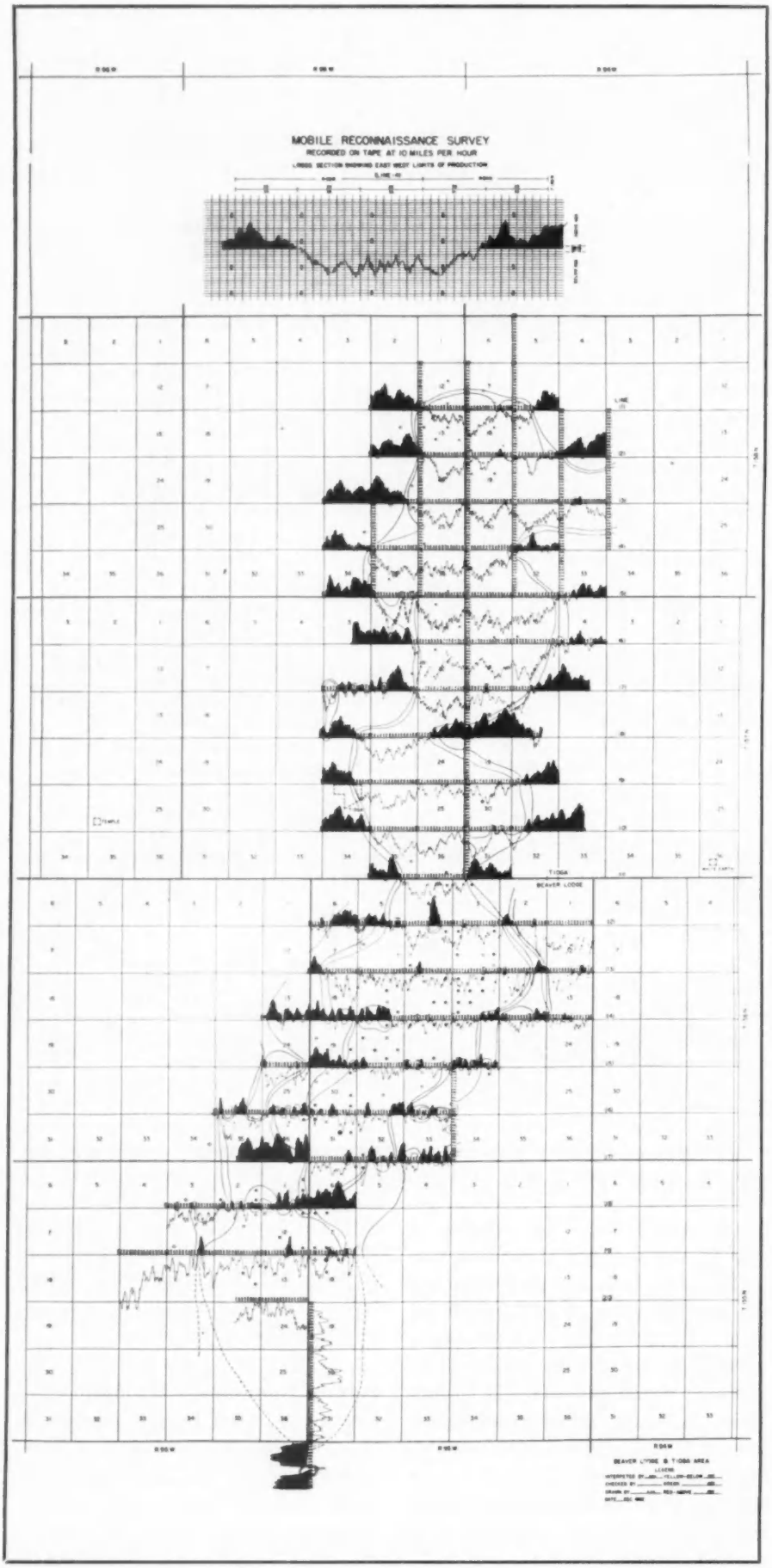

Fig. 4—Reconnaissance survey made with fast, mobile equipment.

profile similar to the record of an electric log. This method enables rapid movement wherever light, four-wheel driven equipment may be operated, though it is not recommended for use except over relatively smooth terrain. By this method, the operator has the added advantage of a continuous profile which is not possible when readings are made at stated points only.

Air Reconnaissance. Air reconnaissance is practical with helicopter but does not appear practical with conventional airborne equipment as the speed of travel tends to smooth out the marginal bands of radiation which distinguish an oil pattern from a soil pattern. The time lag at high speeds is too great a variable.

Field Experience. Given a uniform surface soil without erosional distortions and given a single reservoir, radiation surveys, if sufficiently detailed, can effectively and quickly outline oil pools. However, very few areas have completely uniform surface soil and many structures have multiple reservoirs which can result in multiple, overlapping surface patterns. The technique of interpreting complex patterns is substantially outlined below.

Surveys of Proven Fields. Marginal high radiation value patterns have been found near the edges of producing areas, no matter what the type of oil accumulation. In other words, an offshore bar or a saturated river bed will disclose the same marginal pattern as an oil or gas pool wholly structural in character.

Shape and Size of Patterns. The interpreter studies the shape of the patterns in order to determine the nature of the oil accumulation represented. For instance, a buried river bed filled with oil or gas would be mapped as two parallel high-value anomaly bands in the shape of a normal river course. A closed dome would result in a roughly circular or elliptical pattern. A fault trap would have one straight edge above the intersection of the oil horizon with the fault plane while the other side of

the pattern would follow the water-oil contact line.

Like all other objects occurring in nature, shape, size and other characteristics of oil or gas deposits differ and no two are exactly alike. Neither are all border patterns perfect and complete. More frequently than not, breaks occur in the border anomalies through which a single profile line could be run which, taken alone, would condemn a prospect. In all cases the underlying principles are the same, and the variations in pattern are due to natural variations in soil characteristics, stratigraphy and structure.

Exceptional Patterns. In the earlier stages of the development of detailed surveys by use of hand instruments, it was observed that sometimes the values above production were high across the entire area. To the observer at that time it would appear that this condition might prove to be an exception which would tend to work against the basic theory. It was not until suitable ground-borne mobile equipment was developed that the geological observer was able to find a possible explanation for this exceptional pattern. Continuous profiles across such areas were found usually to have margins which were still higher than the average inside value.

Moreover, the inside values turn out to be more ragged (with numerous minor highs) than the type of profile found in the ground or non-productive areas. A study of the character of the producing horizons beneath these exceptional patterns discloses an interesting fact. In the writers' experience, these ragged high-center patterns are almost without exception found above cross-bedded offshore sand bars and sometimes above reefs. In other words this type of pattern reflects the broken continuity of the oil in place.

From the foregoing, it will be clear that irregular normal background patterns have no significance in their relation to the possibility of oil or gas production. A border pattern ("halo") standing out over and above the normal irregular background must be obtained before the interpreter may allow himself to make a favorable report.

About the Authors

DAVID S. LOBDELL is a native of Kansas and attended the University of Kansas. He organized Lobdell & Company, members of the New York Stock Exchange, in 1935. He moved to Texas in 1949 and organized Dell Surveys, Inc., in 1950.

Lobdell

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E. F. BUCKLEY is chairman of the board of Dell Surveys, Inc. He is an engineering graduate of the University of Kansas and has spent more than 20 years in engineering design work. He is a co-founder of Dell Surveys, Inc.

Buckley

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DR. JOHN W. MERRITT of Tulsa is a pioneer in the field of radioactivity surveys designed to implement geological and geophysical techniques in oil exploration. He holds B.S. and M.S. degrees in geology from Northwestern University and a Ph.D. degree in geology and mining from Wisconsin State University. After teaching at Dartmouth College he joined the old Roxana Petroleum Company and in 1922 became a consultant.

Merritt

Application of Basic Concept. Having established the presence of a distinctive radiation pattern around many producing fields, the problem then is with the discovery of comparable patterns in non-producing areas, and in eliminating those which appear similar but are the result of factors other than the presence of oil or gas in such areas.

The values obtained by gamma ray surveying are taken from approximately the top twelve to thirty inches of soil. The map, therefore, depicts a purely surface phenomenon. Since the amount of radioactive elements in surface soils vary considerably with their changes in composition and texture, it is obvious that the surface intensity pattern of various soils will be made up of irregular highs and lows.

Where the soil changes occur such as are found in passing from sandy to heavier soil, the entire average value or background may increase or decrease, the value change coinciding with the margin of the soil change.

Interference Patterns. The surface presence of such materials as sand, gypsum, caliche, limestone, fresh stream outwash material, and other irregular variations from uniform soil, tend to cause interference patterns which make interpretation difficult and sometimes impossible. It becomes apparent, therefore, that for a pattern to be significant with relation to the presence or absence of oil below, the oil-controlled pattern must be strong enough to "shine through" the normally irregular background. Usually, where a strong significant pattern is developed, it will be found to cross high and low background indiscriminately, showing weaker in low background and stronger in high background. However, unless a pattern is strong enough to be clearly unrelated to accidental surface conditions, the interpreter must reject it as questionable.

The foregoing considerations make it clear that any attempt to use

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gamma radiation surveys without close attention to the relationships of drainage patterns and changes in character of the soil will frequently be in error. For these reasons it may be concluded that only surface soil studies can fully eliminate those portions of radiation patterns unrelated to the presence of oil and gas. The geologist in charge must accumulate the data required for discrimination between the effects of drainage and changes in soil character as against patterns due to the presence of oil.

Recommended Uses.

1. To find stratigraphic trap reservoirs where they can be pinned down by geology, to within a fairly close area. The method has had good success in locating stratigraphic traps.
2. To add favorable or unfavorable interpretation to seismic or subsurface data on which test wells are to be drilled.
3. To locate nearby reservoirs from dry holes which have had good oil shows. This is an ideal problem for radiation surveys, providing the geology indicates the possibility of a nearby reservoir. It can usually indicate the direction and distance of such reservoir.
4. To extend reservoirs after the initial discovery well has come in. (For example, the search for reef or sand lens production, gamma ray surveys often can be used to indicate the main body of the reservoir.)
5. To be used as a low-cost reconnaissance tool over large, relatively unexplored areas. (Any areas of interest thus developed should be confirmed by other geological or geophysical means before a test well is advisable.)

No well should be drilled solely on radiation data if it is at all possible to obtain correlative geological or geophysical information. It should be considered more as an additional criterion supporting and evaluating the data supplied by other methods of exploration, helping to build a more solid basis for classifying exploration projects. —**The End**

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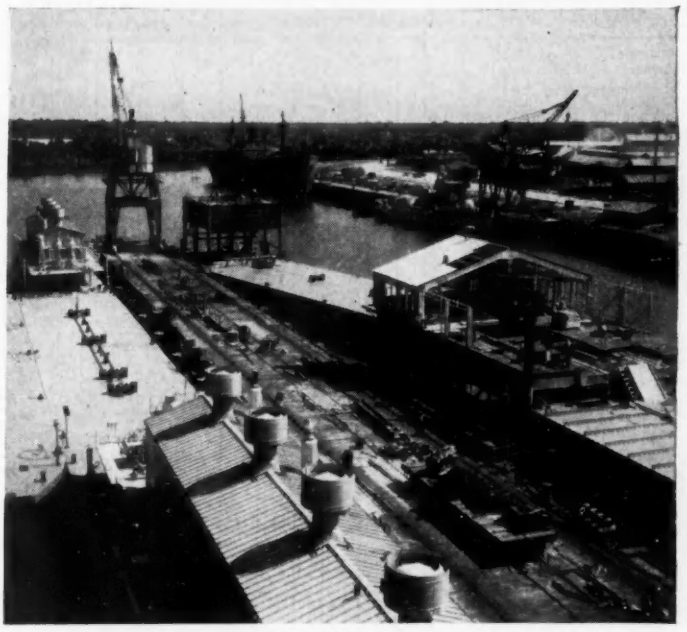

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	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests									Total Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions										
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	6 Mo. 1954	6 Mo. 1953	Wildcats	New Pays	Outposts	6 Mo. 1954	6 Mo. 1953	6 Mo. 1954	6 Mo. 1953
Alabama											6			6												36			36	35	36	35
Arizona											6			6												8			8	5	8	5
Arkansas	1									1	6		1	8	2		1	2		1	1			7	15	41		4	45	52	52	67
California	4									4	35			39	11		2	4		1	3		1	22	42	167		2	169	235	191	277
Colorado	3	1	5							9	49			58	24	3	9				1		1	38	24	220			224	137	262	161
Florida											2			2	1									1		13			13	18	14	18
Georgia																										3			3	3	3	3
Idaho																														2		2
Illinois	5			1			1			7	44			51	15			14			31			61	34	267			267	204	328	238
Indiana	2		1							3	16			19	7		2							9	22	113			113	152	122	174
Kansas	5						1			6	57		1	64	49		9	4		1	3		1	67	94	372		1	373	449	440	543
Kentucky	2									2	1			3	18									18	15	23			23	50	41	65
Louisiana	4	3	1	3	3	2		1		17	35		3	55	17	13	8	23	15	8		2		86	67	174		6	180	179	266	246
North Louisiana				1						1	11			12	1	1	1	4		3				10	13	59		1	60	85	70	98
South Louisiana	4	3	1	2	3	2		1		16	24		3	43	16	12	7	19	15	5		2		76	54	115		5	120	94	196	148
Michigan	2									2	18			20	7						1			8	12	116			116	107	124	119
Mississippi	1									1	15		1	17	1									2	14	76		3	79	100	81	114
Missouri																										6			6	7	6	7
Montana	1		1	1						3	8			11	3		1	2						6	5	41			41	38	47	43
Nebraska	4		2				2			8	12			21	12		3	1			3			19	16	55		1	56	75	75	91
Nevada	1									1	5			6	1									1		7			7	6	8	6
New Mexico			3							3	12			16	9		17	2	2		4			34	26	88		1	89	64	123	90
North Dakota											10			10	1			1			2			4	6	49			49	20	53	26
Ohio																					3		3	6	2	7			7	10	13	12
Oklahoma	10			1			4			15	58			73	56	6	10	15	1	1	41	2	2	134	127	336			336	363	470	490
Pennsylvania																									1	1						1
South Dakota											3			3	1									1		8			8	5	9	5
Texas	44	15	3	18	4		9	2	1	96	367		7	470	266	40	47	109	32	10	55	9	11	579	586	2022		31	2053	2117	2632	2703
Dist. 1 S. Central	3									3	25			28	17	2	3		1	1	5	2	1	32	14	125		1	126	169	158	183
Dist. 2 Middle Gulf		2	1		1					4	22			26	3	6	8	2	1	1	3	1	2	27	36	130		3	133	144	160	180
Dist. 3 Upper Gulf	2	2		4	3		1			12	39		5	56	12	6	2	35	12	3	1			71	79	194		17	211	215	282	294
Dist. 4 L. Gulf-SW		6		6				1	1	14	25		1	40	13	15	2	24	14	2	2	5	2	79	104	187		5	192	224	271	328
Dist. 5 E. Central											19			19				1			1			2	7	70			70	69	72	76
Dist. 6 Northeast		1	1							2	18		1	21	2	1	1		1					5	10	79		2	81	64	86	74
Dist. 7-B N. Cent.	15			2			1			18	52			70	76		15	10			4		2	107	128	409			409	474	516	602
Dist. 7-C W. Cent.	4	1	1	1			2			9	46			55	24	3	6	6	1	1	5			47	54	177		1	178	177	225	231
Dist. 8 West	7			3			4			14	24			38	55	2	3	13	1	2	27		1	104	64	208		1	209	172	313	236
Dist. 9 North	12	2		2			1			17	86			103	62	3	2	18			7		1	93	88	411		1	412	408	505	496
Dist. 10 Panhandle	1	1						1		3	11			14	2	2	5		1			1	1	12	2	32			32	1	44	3
Utah											4			4	3		1							3	5	14			14	25	17	30
Wyoming	8									8	21			29	45		2	7			3			57	11	101			101	52	158	63
Total U.S.	97	19	16	24	7	2	17	3	1	186	791		14	991	549	62	112	184	50	22	151	14	19	1163	1124	4363		53	4416	4510	5579	5634

Exploration Second Highest in History

991 wells completed in June boost the first-half total to 5579, 55 less than last year's record.

By CECIL W. SMITH, WORLD OIL Staff

EXPLORATORY WELLS completed in June amounted to 991 to boost the year's first-half total to 5579 wells, only 55 tests less than the all-time peak of 5634 in the first half of 1953.

Although this year's efforts must take a back seat to last year's, the results have been in this year's favor. Total wells were down slightly less than 1 percent while those that proved successful bested last year's by 3.5 percent. A total of 1163 tests found production in commercial quantities and they amounted to 20.8 percent of the total drilled, while a year ago producers amounted to 1124 or 20 percent of the total completed.

Activity in Texas, the No. 1 wildcat drilling state, was 2.6 percent less this year than it had been in the first six months of last year. Texas' exploratory completions numbered 2632 this year against 2703 last year.

Wildcatters accounted for 570 completed wells in Oklahoma to top last year's record of 490 tests by 16.3 percent. Kansas' operations declined from 543 in 1953 to 440 wells, a drop of 19 percent.

The largest gain among the leading states occurred in Illinois where exploration resulted in 328 completed wells that topped last year's 238 by 37.8 percent.

Drilling efforts in the whole U. S. were rewarded by the discovery of 733 new oil pools during the first six months. New distillate pools numbered 112 and gas discoveries totaled 134 in the same period.

Summary of Results of Exploratory Drilling

ITEM	June, 1954	May, 1954	SIX MONTHS January-June 1954	1953	Percent Diff.
Oil Discoveries	**121**	**127**	**733**	**707**	**+ 3.7**
New Fields	97	91	549	506	+ 8.5
New Pays	24	36	184	201	— 8.5
Distillate Discoveries	**26**	**20**	**112**	**80**	**+40.0**
New Fields	19	9	62	53	+17.0
New Pays	7	11	50	27	+85.2
Gas Discoveries	**18**	**24**	**134**	**134**	.....
New Fields	16	19	112	110	+ 1.8
New Pays	2	5	22	24	— 8.3
Total Discoveries	**165**	**171**	**979**	**921**	**+ 6.3**
Extension to Fields	**21**	**42**	**184**	**203**	**— 9.4**
Oil Fields	17	37	151	164	— 7.9
Distillate Fields	3	1	14	18	—22.2
Gas Fields	1	4	19	21	— 9.5
Total Prod. Tests	**186**	**213**	**1,163**	**1,124**	**+ 3.5**
Dry Holes	**805**	**751**	**4,416**	**4,510**	**— 2.1**
Wildcats	791	743	4,363	4,424	— 1.4
New Pays	.....	.....	.....	.....	.....
Outposts	14	8	53	86	—38.4
Total Expl'tory Tests	**991**	**964**	**5,579**	**5,634**	**— 1.0**
Percent Productive	18.8	22.1	20.8	20.0	.....
Percent Dry	81.2	77.9	79.2	80.0	.....

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WORLD-WIDE EXPERIENCE

U. S. Discoveries in June

NEW FIELDS, NEW PAYS AND EXTENSIONS

ARKANSAS—NEW OIL FIELD

Union County, Hillsboro, South field. Pan Am Southern Corp. & Olin O&G Corp.'s Olin 2, C SE SE SE 26-18s-14w, flowed 102 barrels from Glen Rose sand, Lower Cretaceous 3492-3500 feet, 20/64-inch, 44.7-gravity, completed 6-27-54, TD 4507.

CALIFORNIA—NEW OIL FIELDS

Kern County, Devils Den area. Kenmac Oil Company's Bates Estates 27X-20, in 20-25s-19e, pumped 22 barrels from 1470-1560 feet, 25.7-gravity, completed 6-26-54, TD 1560.

Lost Hills area. Union Oil Co.'s Seaboard-Saunders 63-29, in 29-25s-20e, pumped 12 barrels from 2432-93 feet, 25.5-gravity, completed 6-19-54, TD 2567.

Los Angeles County, Charlie Canyon area. The Texas Co.'s Hartje 1, in 31-5n-16w, pumped 9 barrels from 817-50 feet, 15.7-gravity, completed 6-12-54, TD 1069.

Tulare County, Porterville area. Navy Oil Co., Inc.'s Navy 1, in 9-22s-27e, pumped 16 barrels from 870-1015 feet, completed 5-28-54, TD 1197.

COLORADO—NEW OIL FIELDS

Logan County. Miracle-Fifer Drilling Co.'s J. H. Monroe 1, NE NE NW 10-8n-53w, flowed 321 barrels from "D" sand, Upper Cretaceous 4792-4802 feet, completed 6-5-54, TD 4960.

Unnamed field. Shell Oil Co.'s State 1-A, C NW SE 32-7n-52w, flowed 249 barrels from "D" sand, Upper Cretaceous 4457-65 feet, 21/64-inch, completed 6-21-54, TD 4550.

Morgan County. Lion Oil Co.'s Bruce 1, SE NE NW 26-1n-58w, pumped 72 barrels from "J" sand, Upper Cretaceous 5770-75 feet, completed 6-4-54, TD 5855.

COLORADO—NEW DISTILLATE FIELD

Morgan County. Aurora Gasoline Co.'s Lauck 1, SW SW NE 25-3n-58w, flowed 144 barrels oil and 5.0 million from "D" sand, Upper Cretaceous 5554-58 feet, ½-inch, completed 6-23-54, TD 5645.

COLORADO—NEW GAS FIELDS

Adams County. Eddie Fisher's Kolettis 1, SW SW SW 11-1s-58w, flowed 2.3 million from "J" sand, Upper Cretaceous 5819-5935 feet, completed 6-10-54, TD 5935.

Unnamed field. Ginther, Warren & Ginther's Leasure 1, SE SE SW 17-2s-59w, flowed 2.5 million from "J" sand, Upper Cretaceous 6258-6412 feet, completed 6-10-54, TD 6412.

Logan County. British American Oil Producing Co.'s Elwood 1, C SW NE 15-10n-54w, flowed 4.0 million from "D" sand, Upper Cretaceous 5032-5200 feet, completed 6-20-54, TD 5200.

Unnamed field. H. C. Arnold's State 1-A, C SW NE 11-7n-55w, flowed 9.0 million from "D" sand, Upper Cretaceous 5307-11 feet, completed 6-24-54, TD 5535.

Morgan County. Ray Campbell & Earl Siler's Ross 1, C N ½ NE NW 23-3n-59w, ungauged from "D" sand, Upper Cretaceous 5904-23 feet, completed 6-15-54, TD 6032.

ILLINOIS—NEW OIL FIELDS

Bond County, Dudleyville, East field. Miami Operating Co.'s R. Buchmiller 1, SE NE 36-5n-3w, old well worked over, pumped 42 barrels from Devonian lime, Devonian 2384-90 feet, completed 6-8-54, TD 2444.

Old Ripley field. A. Wilson's Zobrist-Cordes 1, NE SW SW 22-5n-4w, pumped 18 barrels from Pennsylvanian sand, Pennsylvanian 593-612 feet, completed 6-8-54, TD 612.

Edwards County, Bone Gap, West field. National Association Petroleum Co.'s Edwin Gill 1, SW SE NW 16-1s-10e, pumped 28 barrels from Lower O'Hara lime, Mississippian 3290-95 feet, completed 6-29-54, TD 3362.

Macoupin County, Staunton, West field. R. Updike's G. Seniker 1, 22-7n-7w, pumped 8 barrels from Pennsylvanian sand, Pennsylvanian 506-16 feet, completed 6-8-54, TD 516.

White County, Norris City field. C. E. Brehm's H. Yates et al 1, SE NW SW 33-6s-8e, pumped 75 barrels from Aux Vases sand, Mississippian 2989-3002 feet, completed 6-29-54, TD 3006.

ILLINOIS—NEW OIL PAY

White County, Concord, North field. A. Eron's Cutchins et al SE SW 10-6s-10e, pumped 60 barrels from Hardinsburg sand, Mississippian 2487-95 feet, completed 6-8-54, TD 3100.

ILLINOIS—OIL FIELD EXTENSION

Christian County, Mt. Auburn, East field. M. H. Richardson's F. Long 1, SW NW SW 17-15n-1w, 1-mile extension, pumped 138 barrels from Silurian lime, Silurian 1902-23 feet, completed 6-22-54, TD 1923.

KANSAS—NEW OIL FIELDS

Harper County. Pickrell Drilling Co.'s Campbell 1, NE NE NE 36-31s-9w, potentialed 2565 barrels from Mississippi lime, Mississippian 4368-88 feet, TD 4500.

Kingham County, Willowdale field. Aylward Drilling Co. & Aurora Gasoline's Amsden 1, SW SW SW 11-29s-9w, pumped 265 barrels from Viola lime, Ordovician 4501-06 feet, TD 4688.

Pratt County, Earl field. Lario O&G Co.'s Earl Moore 1, SW SW SE 36-28s-14w, potentialed 1258 barrels from Lansing lime, Pennsylvanian 4223-27 feet, TD 4661.

Sumner County, Haven, South field. Herndon Drilling Co.'s Yearout 1, SW SW NW 2-35s-1w, flowed 925 barrels from Simpson sand, Ordovician 4190-94 feet, TD 4194.

Padgett, West field. Greenland Drilling Co.'s Hills 1, NW NW SE 21-34s-2e, pumped 25 barrels from Layton lime, Permian 2822-30 feet, TD 3538.

KANSAS—OIL FIELD EXTENSION

Sedgwick County, Hohn field. A. D. Allison's Wilber 1, SE SW SW 15-27s-1w, ½-mile north extension, pumped 20 barrels from Kansas City lime, Pennsylvanian 2755-2806 feet, TD 3200.

KENTUCKY—NEW OIL FIELDS

McLean County. Miller-Shiarella-Ashland's Eb Anderson et al 1, 25-N-28, pumped 75 barrels from Tar Springs sand, Mississippian 1676-88 feet, TD 2373.

Unnamed field. The Texas Co.'s D. T. Edwards 1, 9-N-26, pumped 20 barrels oil and 8 barrels water from Cypress sand, Mississippian 1792-1807 feet, and Benoist sand, Mississippian 2089-98 feet, TD 2255.

NORTH LOUISIANA—NEW OIL PAY

Caddo Parish, Rodessa field. Union Producing Co.'s Caddo Levee Board B-1, in 26-23n-16w, flowed 161 barrels from Travis Peak sand, Lower Cretaceous 6823-33 feet, 9/64-inch, 48.6-gravity, completed 6-7-54, TD 11,450.

SOUTH LOUISIANA—NEW OIL FIELDS

Beauregard Parish, Clear Creek area. H. L. Hunt's Cornelius Doornbos 1, in 12-6s-8w, flowed 135 barrels from 8897-8905 feet, 8/64-inch, completed 6-29-54, TD 10,500.

St. Bernard Parish, Eloi Bay area. The Texas Co.'s State Lease 2219-2, flowed 49 barrels oil and 1/10 million from 6072-80 feet, 6/64-inch, 27.6-gravity, completed 6-7-54, TD 9510.

St. Mary Parish, Eugene Island area. Shell Oil Co.'s State Lease 1667-1, Block 18, Gulf of Mexico, flowed 317 barrels oil and 0.3 million from 9362-70 feet, 9/64-inch, 36.6-gravity, completed 6-24-54, TD 11,525.

Terrebonne Parish, Halter Island area. Humble O&R Co.'s Louisiana Land & Exploration Co. K-3, in 22-19s-12e, flowed 360 barrels from 10,704-710 feet, 3/16-inch, 36.1-gravity, completed 6-25-54, TD 10,767.

SOUTH LOUISIANA—NEW OIL PAYS

Jefferson Parish, Grand Isle field. Humble's State Lease 797 E-2, Block 18, Gulf of Mexico, flowed 215 barrels from 9567-90 feet, ⅛-inch, 38.3-gravity, completed 6-14-54, TD 9936.

Plaquemines Parish, Main Pass-Block 24 field. The California Co.'s Louisiana State 2410-3, in Gulf of Mexico, flowed 142 barrels from 8455-60 feet, 8/64-inch, 31-gravity, completed 5-24-54, TD 9020.

SOUTH LOUISIANA—NEW DISTILLATE FIELDS

LaFourche Parish, West Bay, Southeast field. Gulf Refining Co.'s H. J. Harvey

1-C, in 29-23s-31e, flowed 44 barrels distillate and 1.4 million from 7623-35 feet, 10/64-inch, 45.8-gravity, completed 6-25-54, TD 8000.

Terrebonne Parish. Murmonill Corp.'s Parche 1, in 96-17s-17e, flowed 8 barrels distillate and 1.8 million from 10,068-074 feet, 12/64-inch, 54.6-gravity, completed 6-1-54, TD 10,165.

Unnamed field. Warren Petroleum Corp.'s South Coast 1, in 12-17s-17e, flowed 27 barrels oil and 6.1 million from 11,620-630 feet, 12/64-inch, 40.9-gravity, completed 6-20-54, TD 13,340.

SOUTH LOUISIANA—NEW DISTILLATE PAYS

Cameron Parish, Grand Chenier field. Fifteen Oil Co.'s C & J Nunez 1, 13-15s-5w, flowed 44 barrels distillate and 4.4 million from 10,802-807 feet, ¼-inch, 48.5-gravity, completed 5-27-54, TD 13,025.

Mud Lake, East field. The Texas Co.'s Miami Corp. 2, in 13-14s-11w, flowed 70 barrels distillate and 6.0 million from 12,830-890 feet, 15/64-inch, 43.2-gravity, completed 6-30-54, TD 12,920.

LaFourche Parish, Cut off field. The California Co.'s Clovelly 3, 44-18s-21e, flowed 86 barrels distillate and 2.5 million from 9385-9417 feet, 3/16-inch, 54.3-gravity, completed 5-26-54, TD 10,908.

SOUTH LOUISIANA—DISTILLATE FIELD EXTENSION

Cameron Parish, Cameron field. Stanolind O&G Co.'s J. A. Davis 1-C, 25-14s-10w, ½-mile W extension, flowed 40 barrels distillate and 3.2 million from 9839-43 feet, 12/64-inch, 49.9-gravity, completed 5-28-54, TD 10,912.

SOUTH LOUISIANA—NEW GAS FIELD

Cameron Parish, West Cameron area. Superior Oil Co.'s Bureau of Land Management A-4, Block 149, Gulf of Mexico, flowed 2.1 million from 8752-59 feet, 18/64-inch, 47.2-gravity, completed 6-1-54, TD 8808.

SOUTH LOUISIANA—NEW GAS PAYS

Assumption Parish, East Lake Palourde field. Union Oil Co. of Calif.'s B. F. Williams 2, in 30-15s-14e, flowed 5.0 million from 13,150-180 feet, ¼-inch, completed 5-31-54.

Terrebonne Parish, Bourg field. Arkansas Fuel Oil Corp.'s Lecompte 1, in 38-17s-18e, ungauged from 11,466-476 feet, completed 6-8-54, TD 12,085.

MICHIGAN—NEW OIL FIELDS

Allegan County, Ganges "4" field. Orville Palmer's Hutchins 1, NW NE SW 4-2n-16w, pumped 25 barrels from Traverse lime, Devonian 1287-89 feet, completed 6-54, TD 1289.

Bay County. Bell & Gault's Holey 1, NW NW SW 31-15n-3e, pumped 6 barrels from Berea sand, Mississippian 2360-70 feet, completed 6-54, TD 4754.

MISSISSIPPI—NEW OIL FIELD

Jefferson County. Calto Oil Co., Jett Drilling Co., Inc. & R. H. Alagood's Mary Fred Walser et al 1, in 25-8n-1w, flowed 84 barrels from Wilcox-Artman sand, Eocene 5586-88 feet, completed 6-20-54, TD 6007.

MONTANA—NEW OIL FIELD

Liberty County, Bears Den area. Meeks et al's Watford 2, NW NW NW 17-36n-6e, pumped 12 barrels from Ribbon sand, Lower Cretaceous 2450-2636 feet, completed 6-1-54, TD 2636.

MONTANA—NEW OIL PAY

Richland County, Brorson field. Sun Oil Co. & Phillips Petroleum Co.'s Dynneson 2, C SW SW 29-24n-58e, pumped 188 barrels from Mission Canyon lime, Mississippian 9128-9220 feet, completed 6-21-54, TD 9744.

MONTANA—NEW GAS FIELD

Carbon County. Cities Service Oil Co. & Carroll Kirk's Kelley 1, C SW SW 12-7s-22e, flowed 1.8 million from Greybull sand, Lower Cretaceous 5195-5220, completed 6-10-54, TD 6375.

NEBRASKA—NEW OIL FIELDS

Cheyenne County. British American's Maley 1, NW NW SE 25-13n-50w, flowed 188 barrels from "D" sand, Upper Cretaceous 4926-38 feet, 18/64-inch, completed 6-8-54, TD 5008.

Kimball County. Natural Gas & Oil Co.'s Durland 1, C NE NW 5-14n-55w, pumped 380 barrels from "J" sand, Upper Cretaceous 6306-12 feet, completed 6-11-54, TD 6372.

Unnamed field. Rockhill Oil Co.'s Vowers 1, NW NW SE 3-13n-55w, pumped 205 barrels from "J" sand, Upper Cretaceous 6350-96 feet, completed 6-11-54, TD 6396.

Unnamed field. Shell Oil Co.'s Schmid 1, SW SE 1-16n-54w, pumped 21 barrels from "J" sand, Upper Cretaceous 5773-78 feet, completed 6-2-54, TD 5840.

NEBRASKA—OIL FIELD EXTENSIONS

Cheyenne County, Cook field. Rocky Mountain Drilling Co.'s Franzen 1, NE NW SW 25-15n-48w, pumped 155 barrels from "D" sand, Upper Cretaceous 4331-41 feet, completed 6-4-54, TD 4341.

Fleming field. Harper & Turner-Dunn & Boreing's Dimick 1, NW NW NW 21-13n-50w, 3/4-mile extension, flowed 12 barrels from "J" sand, Upper Cretaceous 4987-90 feet, 3/8-inch, completed 6-23-54, TD 5038.

NEBRASKA—NEW GAS FIELDS

Cheyenne County. Derby Oil Co.'s Wilson 1, SE SE NE 13-12n-52w, ungauged from "J" sand, Upper Cretaceous 5164-5244 feet, completed 6-10-54, TD 5244.

Unnamed field. Ohio Oil Co.'s Eggleston 1, SE NW SE 26-13n-51w, flowed 3.5 million from "J" sand, Upper Cretaceous 5038-42 feet, completed 6-18-54, TD 5136.

NEVADA—NEW OIL FIELD

Nye County, Eagle Springs area. Shell Oil Co.'s Unit 1, SW NE NW 35-9n-57e, pumped 410 barrels oil and 37 barrels water from Tertiary 6430-6730 feet, 27.8-gravity, completed 6-18-54, TD 10,358.

NEW MEXICO—NEW GAS FIELDS

Rio Arriba County. El Paso Natural Gas Co.'s San Juan 27-4 Unit 2, SW NE SW 5-27n-4w, flowed 0.2 million from Mesaverde sand, Upper Cretaceous 5736-5950 feet, completed 2-22-54, TD 5950.

San Juan County. J. Glenn Turner's Turner-Ballard 3-14, in 14-26n-9w, flowed 1.1 million from Pictured Cliffs sand, Upper Cretaceous 1990-2028 feet, completed 6-9-54, TD 2028.

Unnamed field. Pubco Development Corp.'s Russell-Federal 1, SE SE SW 4-29n-14w, flowed 2.4 million from Mesaverde sand, Upper Cretaceous 5694-5760 feet, completed 1-27-54, TD 5760.

OKLAHOMA—NEW OIL FIELDS

Atoka County, Boggy Depot, Southeast field. Gulf Oil Corp.'s R. B. Butler 1, C SW NE 21-3s-10e, pumped 28 barrels from Atoka sand, Pennsylvanian 2984-3016 feet, 31.2-gravity, TD 7259.

Cleveland County, Hill, South field. Calvert Drilling Co.'s Foster 2, SE NE NE 14-10n-1e, pumped 7 barrels oil and 9 barrels water from Wilcox sand, Ordovician 6095-6115 feet, 37-gravity, TD 6115.

Creek County, Depew Townsite field. Floyd Hubbell et al's Shannon 1, SE NE NE 12-15n-7e, flowed 102 barrels oil and 7 barrels water from Dutcher sand, Pennsylvanian 3321-26 feet, 12/64-inch, 36-gravity, TD 3326.

Garvin County, Foster, Northeast field. Jake L. Hamon's Harrison McGee 1, C SE SW 24-2n-3w, flowed 336 barrels from Hartshorne sand, Pennsylvanian 7732-46 feet, ¼-inch, 45-gravity, TD 7922.

Purdy, Northwest field. Sinclair's Mollie L. Shelton 1, E½ NE SW 15-3n-4w, flowed 249 barrels from Hartshorne sand, Pennsylvanian 8,903-934 feet, ¼-inch, 39.5-gravity, TD 12,095.

Greer County. B H & C Oil Co.'s Sams Sells 1, NE SE SE 5-7n-21w, pumped 7 barrels from Granite Wash sand, Pennsylvanian 1134-54 feet, TD 1450.

Kay County. H. Waggoner's Buessing 1, SW SW SE 32-27n-1e, pumped 75 barrels from Mississippi Chat, Mississippian 3622-67 feet, TD 3910.

Oklahoma County, Newalla, Southwest field. Republic Natural Gas' Zina M. McClelland 1, SE SE SE 29-11n-1e, flowed 52 barrels oil and 4 barrels water from Hunton lime, Devonian 6845-50 feet, ½-inch, TD 6627.

Oklahoma County, Orchard City, Southwest field. Ashland O&R Co. & Webster Drilling Co.'s James H. McNew 1, C SE SW 14-11n-1w, flowed 247 barrels from Misener sand, Mississippian 6108-18 feet, ¼-inch, TD 6681.

Payne County, Stillwater, Southwest field. T. N. Berry's Andrews 1, NW SE SE 28-19n-2e, flowed 40 barrels from Red Fork sand, Pennsylvanian 4174-84 feet, ¼-inch, 39-gravity, TD 4189.

OKLAHOMA—NEW OIL PAY

Texas County, Eva, Northwest field. Gulf's H. H. Hixon 1, C NE NW 11-4n-10ecm, flowed 322 barrels from Cherokee sand, Mississippian 4006-28 feet, 15/64-inch, 47-gravity, TD 4500.

OKLAHOMA—OIL FIELD EXTENSIONS

Creek County, Kellyville, North field. Wilcox's Waggoner 1, SW SW NE 22-18n-10e, flowed 216 barrels from Red Fork sand, Pennsylvanian 2155-70 feet, ¼-inch, TD 2693.

Kay County, Dilworth field. Royal Oil Co.'s School Land 1, SW SE NE 13-29n-

1e, flowed 40 barrels from Cleveland sand, Pennsylvanian 3146-86 feet, 17/64-inch, 41-gravity, TD 3590.

Lincoln County, Sunflower, Southeast field. N. T. Smith et al's Schmidt 1, SW NW SW 16-14n-2e, SE Extension, flowed 28 barrels from Checker Board sand, Pennsylvanian 3787-3802 feet, 1/8-inch, 55-gravity, TD 3840.

Pontotoc County, Francis field. Great Western O&G Co.'s Jessie Daniles 1, NE NW SW 23-5n-6e, flowed 70 barrels from Thurman sand, Pennsylvanian 1717-23 feet, 5/16-inch, 34-gravity, TD 1850.

TEXAS DISTRICT 1—NEW OIL FIELDS

Atascosa County. Carter & Carter's Stanley Brauchle 1, I&M Survey, Section 64, pumped 14 barrels from Navarro sand, Upper Cretaceous 4290-4317 feet, 38-gravity, completed 3-16-54, TD 4317.

Wilson County. A. T. Jergins' Mary A. Talbot 1, C. Zepeda Survey, pumped 6 barrels from 2855-66 feet, 30-gravity, completed 5-7-54, TD 2950.

"John Scott-Bartesch" field. Sutton Drilling Co.'s H. C. Stroud 2, M. Herrera Survey, pumped 55 barrels from 1610-14 feet, 27-gravity, completed 5-27-54, TD 1654.

TEXAS DISTRICT 2—NEW DISTILLATE FIELDS

Bee County, Blanconia area. Armstrong & Horn—Smith & Kendall's C. A. Barber 1, John Kelly Survey, flowed 80 barrels distillate and 20.0 million from Frio sand, Oligocene 4825-39 feet, open, 56-gravity, completed 6-22-54, TD 4880.

Dewitt County. Kirkwood & Co.'s Annie Barre 1, James Quinn Survey, flowed 600 barrels distillate and 24.0 million from Wilcox (2nd Massive) sand, Eocene 8105-14 feet, 56.6-gravity, completed 6-11-54, TD 8323.

TEXAS DISTRICT 2—NEW DISTILLATE PAY

Calhoun County, Jay Welder field. H. R. Smith's Jay Welder 1, Eusebio Hidalgo Grant, flowed 1725 barrels distillate and 40.0 million from 5817-24 feet, open, 54.1-gravity, completed 4-17-54, TD 5855.

TEXAS DISTRICT 2—NEW GAS FIELD

Victoria County. Currie B. Davis et al's Albert Billo 1, John Chevers Survey, flowed 12.0 million from Frio sand, Oligocene 3472-75 feet, open, completed 6-15-54, TD 4403.

TEXAS DISTRICT 3—NEW OIL FIELDS

Harris County. The Ohio Oil Co.'s C. A. Dwyer et al 1, George M. Patrick Survey, flowed 175 barrels from 7012-22 feet, 9/64-inch, 43.2-gravity, completed 6-3-54, TD 8513.

Orange County, Lemonville, South field. Houston Oil Co. American Republics Corp.'s Preston Edward Lindsey et al 1-A, Josiah Reenes Survey, flowed 65 barrels from Lindsey (U Hackberry) sand, Oligocene 7788-91 feet, 6/64-inch, 42.4-gravity, completed 6-8-54, TD 8602.

TEXAS DISTRICT 3—NEW OIL PAYS

Fort Bend County, Blue Ridge field. Christie, Mitchell, & Mitchell's West-Schenck 1, Thomas Habermacher Survey, flowed 171 barrels from Vicksburg sand, Oligocene 7815-19 feet, 8/64-inch, 22.7-gravity, completed 6-21-54, TD 7954.

Harris County, Fairbanks, North field. Rowan Oil Co., Texas & Pacific Coal & Oil Co. & H. E. Williams' Clark Henry Gas Unit 1-2, John M. Dement Survey, flowed 80 barrels oil and 24 barrels water from 7071-74 feet, 1/8-inch, 41.2-gravity, completed 6-11-54, TD 8305.

Harris County, Humble-Light field. Wilson Oil Co.'s H. C. House-Light 50, Mary Owens Survey, flowed 92 barrels from 4012-22 and 4048-58 feet, 16/64-inch, 35.2-gravity, 6-11-54, TD 4110.

Wharton County, Hornberger field. Caribbean Oil Corp.'s Bessie Hudgins 1, J. LaBauve Survey, Section 18, flowed 47 barrels from 5469-73 feet, 10/64-inch, 25.9-gravity, completed 6-7-54, TD 5500.

TEXAS DISTRICT 3—OIL FIELD EXTENSION

Chambers County, Trinity Bay field. Humble's Galveston Bay State G-2, Section 18-C, ½-mile NW Extension, flowed 137 barrels from 7631-34 feet, X-28, 34.4-gravity, completed 6-21-54, TD 8591.

TEXAS DISTRICT 3—NEW DISTILLATE FIELDS

Chambers County. McCarthy O&G Corp.'s Mrs. Annie Franklin et al 1, Samuel Mather Survey, ungauged, completed 5-22-54, TD 12,634.

Colorado County. Charles H. Osmaond, Hill & Hill, A. W. Cherry's Lehrer 1, Sam Kennelly League, flowed 570 barrels distillate and 21.0 million from Wilcox sand, Eocene 9685-9705 feet, open, 49.8-gravity, completed 4-10-54, TD 9706.

TEXAS DISTRICT 3— NEW DISTILLATE PAYS

Brazoria County, North Rowan field. Texas Eastern Production Corp.'s North Rowan Unit 3-1, Block 2-A, Otto Redeker Subdivision, flowed 204 barrels distillate and 1.1 million from 10,263-273 feet, completed 5-18-54, TD 11,501.

Colorado County, Englehart field. H. J. Chavanne's Minarcik 3, Sam Kennelly Survey, flowed 557 barrels distillate and 7.3 million from Cockfield sand, Eocene 6002-11 feet. 57.6-gravity and 1662 barrels distillate and 13.4 million from Cockfield sand, Eocene 6304-6316 feet, 55.4-gravity, completed 6-16-54, TD 6535.

Hardin County, Sour Lake-NE Flank field. Clegg & Hunt et al's Hooks et al 1, BBB&C Survey, flowed 1247 barrels distillate and 12.6 million from Yegua sand, Eocene 9826-34 feet, 54.2-gravity, and 969 barrels distillate and 6.0 million from Yegua sand, Eocene 10,006-014 feet, 53.5-gravity, completed 6-23-54, TD 10,200.

TEXAS DISTRICT 4—NEW OIL PAYS

Aransas County. Renwar Oil Corp.-Heep Oil Corp.-Jack Modesett's Travis Bailey 1, Joseph Fessender Survey, Old Well Drilled Deeper, flowed 181 barrels from Frio I-3 sand, Oligocene 8821-26 feet and ungauged distillate from Frio U "M" sand, Oligocene 9650-54 and 9660-66 feet, 38.5-gravity, completed 6-21-54, TD 10,609.

Kleberg County, Borregos field. Humble's King Ranch-Borregos 129, Santa Gertrudis Grant, flowed 73 barrels from N-13 sand, Oligocene 6306-16 feet, 1/8-inch, 37-gravity, completed 6-5-54, TD 6-5-54.

Del Grullo field. The Texas Co.'s State Tract 83-1, Cayo Del Grullo Bayo Tract 83, flowed 8 barrels from 8507-20 feet, 3/4-inch, 38.6-gravity, completed 4-25-54, TD 11,271.

Nueces County, Calallen field. Rockhill Oil Co. et al's Elmer D. Wood et al 1-A, Block 5, Wade Riverside Subdivision, flowed 187 barrels from Vicksburg sand, Oligocene 8230-35 feet, 9/64-inch, 38-gravity, completed 6-2-54, TD 8755.

Clarkwood, South field. W. M. Bevly's N. V. Rambo 2, J. H. Gallagher Survey, flowed 75 barrels from Frio sand, Oligocene 6859-62 feet, 9/64-inch, 31.2-gravity, completed 6-20-54, TD 8086.

San Patricio County, Angelita, North field. Spartan Drilling Co.'s Aaron Lawhon 1, Welder & Odem Subdivision, flowed 130 barrels from Frio sand, Oligocene 7672-78 feet, 8/64-inch, 37.6-gravity, completed 6-29-54, TD 7748.

TEXAS DISTRICT 4—NEW DISTILLATE FIELDS

Duval County. Oceanic Oil Co.'s Gertrudis Canales Est. 1, Jose Marcello Hinojosa Grant, ungauged from 5050-58 feet, completed 5-20-54, TD 6108.

Hidalgo County. Heep Oil Corp. et al's Mary O'Brien Shary Unit 1, Porcion 53, Lot 53-1, flowed 300 barrels distillate and 12.5 million from 6604-14 feet, open, 58-gravity, completed 4-20-54, TD 8531.

Jim Wells County. Reese & Dunn's Guadalupe M. de Perez 2, La Tinaja de Lara Survey, flowed 154 barrels distillate and 13.5 million from Frio-Bierstadt sand, Oligocene 4775-81 feet, 63-gravity and 25 barrels distillate and 1.7 million from Frio-Lou Ella sand, Oligocene 5134-44 feet, 60.37-gravity, completed 5-30-54, TD 5400.

Nueces County. George W. Graham's Dorsogna 1, F. Z. Bishop Subdivision, Petronilla Ranch, flowed 25 barrels distillate and 5.1 million from 8170-80 feet, open, completed 4-25-54, TD 9020.

Unnamed field. Kirkwood & Morgan, Inc.'s Stephan Swetlick 1, Gregoria Farias Grant, flowed 225 barrels distillate and 16.0 million from Frio-Swetlick sand, Oligocene 5355-60 feet, open, 72-gravity, Completed 5-19-54, TD 6522.

Starr County, "Saucito" field. Hawn Brothers et al's H. B. Guerra 1, Survey #270, Old Well Worked Over, flowed 25 barrels distillate and 4.2 million from 4930-

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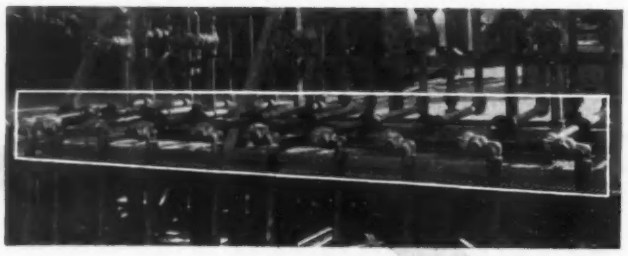

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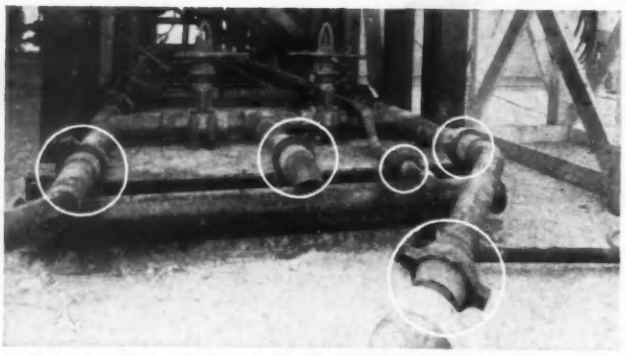

WECO Fig. 602 Unions on the rig's mud line.

WECO Unions pay their way many times over in longer life, trouble-free service and leak-proof sealing. The time and work saved in rigging-up and tearing-down mean more savings for you.

The WECO Fig. 602 Union is an outstanding example. Strong, tough and compact, it withstands the severe conditions and high pressures of present day deep drilling. Its steel-to-steel Ball and Cone Seat is protected by a replaceable, resilient seal ring.

These photos show some of the WECO Fig. 602 Unions used exclusively on a 10,000-ft. rig recently shipped to a foreign country.

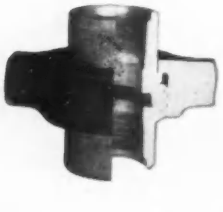

Fig. 602 Union

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40 feet, open, 63.3-gravity, completed 5-27-54, TD 7022.

TEXAS DISTRICT 4—DISTILLATE FIELD EXTENSION

Hidalgo County, Tabasco field. Houston Oil Co. & American Republic's Everett Bell et ux 2, Porcion 76, Section D, Lot 6, Homeville Assn. Subd., ½-mile Northeast Extension, flowed 42 barrels distillate and 3.1 million from Frio sand, Oligocene 8787-8802 and 8822-42 feet, open, completed 2-15-54, TD 9795.

TEXAS DISTRICT 4—GAS FIELD EXTENSION

Duval County, Charamousca, West field. J. W. Gorman, et al's Sideny Adami 1, Arnold & Barrett Suhvey, ½-mile North Extension, ungauged from Yegua sand, Eocene 2018-30 feet, completed 6-5-54, TD 2175.

TEXAS DISTRICT 6—NEW DISTILLATE FIELD

Cherokee County, South Troupe area. Midstates Oil Corp.'s M. C. Chiles 1, W. George Survey, Old Well Worked Over, flowed 12 barrels distillate and 0.5 million from Travis Peak sand, Lower Cretaceous 8820-34 feet, and 8784-8802 feet, 56-gravity, completed 6-20-54, TD 9198.

TEXAS DISTRICT 6—NEW GAS FIELD

Angelina County. Union Production Co.'s Fenley 1, Barr & Davenport Survey, flowed 15.0 million from Glen Rose sand, Lower Cretaceous 7448-78 feet, open, completed 6-4-54, TD 11,511.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Runnels County. Gulf's G. Seitz 1, Section 81, Block 64, H&TC Survey, flowed 59 barrels oil and 10 barrels water from Fry sand, Pennsylvanian 4508-14 feet, ¼-inch, 37.6-gravity, completed 6-24-54, TD 5391.

Tom Green County. Caroline Hunt Trust Estate's Emmett Jacobs 1, Section 953, John Ennert Survey, flowed 336 barrels from Strawn lime, Pennsylvanian 5650-62 feet, ¼-inch, 41.6-gravity, completed 5-26-54, TD 6575.

Unnamed field. Phillips Petroleum Co.'s Griffith 1-A, Section 52, Block 25, H&TC Survey, flowed 408 barrels from Canyon sand, Pennsylvanian 4778-96 feet, ½-inch, completed 6-26-54, TD 5970.

Unnamed field. Taylor O&G Co. & W. Edward Lee's George Foster Rust 1, W. Hillyer Survey #3, pumped 62 barrels oil and 19 barrels water from Strawn sand, Pennsylvanian 3871-82 feet, 2⅜-inch, 26.3-gravity, completed 6-7-54, TD 5202.

TEXAS DISTRICT 7-C—NEW OIL PAY

Runnels County, Lindeman field. T. D. Humphrey & Sons, Ltd.'s C. F. Tounget 3, Block 21, D. Diaz Survey, flowed 34 barrels from Jennings sand, Pennsylvanian 3723-28 feet, 2-inch, 36.9-gravity, completed 6-12-54, TD 3844.

TEXAS DISTRICT 7-C—OIL FIELD EXTENSIONS

Tom Green County, Pecan Station field. C. L. McMahon Inc. et al's J. W. Johnson Estate 2, Section 5, Block 25, H&TC Survey, Northwest extensions, flowed 125 barrels from Canyon lime, Pennsylvanian

4527-44 feet, 16/64-inch, 40-gravity, completed 6-5-54, TD 4939.

Upton County, Amacker-Tippett field. Hunt Oil Co.'s V. T. Amacker 1-105, Section 105, Block D, CCSD&RGNG Survey, ½-mile East Extension, flowed 446 barrels from Ellenburger lime, Ordovician 11,950-12,150 feet, 12/64-inch, 52.1-gravity, completed 6-11-54, TD 12,150.

TEXAS DISTRICT 7-C—NEW DISTILLATE FIELD

Sutton County. Sinclair O&G Co.'s G. H. Davis 1, Section 16, EL&RR Survey, flowed 21 barrels distillate and 3.0 million from Canyon sand, Pennsylvanian 5545-65, 5720-70 feet, 2-inch, completed 5-1-54, TD 5800.

TEXAS DISTRICT 7-C—NEW GAS FIELD

Crockett County, Noelke, Northeast field. Sun Oil Co.'s Shannon Estate 1, League 3, Archer CSL Survey, flowed 3.4 million from Queen sand, Permian 2136-2222 feet, ¼-inch, completed 5-30-54, TD 2222.

TEXAS DISTRICT 8—NEW OIL FIELDS

Borden County. Paul De Cleva's V. H. Wolf 1, Section 40, Block 25, H&TC Survey, pumped 143 barrels oil and 57 barrels water from Wolfcamp lime, Permian 6392-6407, 6421-31, and 6438-41 feet, 2-inch, 43-gravity, completed 6-13-54, TD 7300.

Unnamed field. Phillips Petroleum Co.'s Clayton & Johnson 1-B, Section 17, Block 32, T-4-N, T&P Survey, pumped 93 barrels oil and 7 barrels water from Reef lime, Pennsylvanian 8236-44 feet, 2⅜-inch, 44.2-gravity, completed 6-9-54, TD 8251.

Gaines County. Felmont Oil Corp.'s Terrell County School Land 1, Labor 15, League 309, Terrell CSL Survey, flowed 1680 barrels from Devonian lime, Devonian 12,672-730 feet, ¾-inch, 35.6-gravity, completed 6-10-54, TD 12,785.

Midland County. Cities Production Corp.'s Parks 1, Section 14, Block 41, T-3-S, T&P Survey, flowed 3324 barrels from Ellenburger lime, Ordovician 13,018-083 feet, 1-inch, 51.2-gravity, completed 6-26-54, TD 13,083.

Unnamed field. Forest Oil Corp. & Cities Production Corp.'s Dora Roberts "C-4" 1, Section 46, Block 41, T-3-S, T&P Survey, flowed 3205 barrels oil and 35 barrels water from Ellenburger lime, Ordovician 13,070-233 feet, 1-inch, 49-gravity, completed 6-8-54, TD 13,233.

Unnamed field. Warren Petroleum Corp.'s H. C. Wallin 1, Section 27, Block 41, T-3-S, T&P Survey, flowed 671 barrels from Ellenburger lime, Ordovician 13,280-310 feet, 48/64-inch, 52-gravity, completed 6-12-54, TD 13,424.

Scurry County. Taylor O&G Co.'s Winston Brothers 2, Section 37, Tract 67, Kirkland & Fields Survey, pumped 71 barrels oil and 87 barrels water from Strawn lime, Pennsylvanian 7220-30 feet, 2⅜-inch, 38-gravity, completed 6-2-54, TD 7892.

TEXAS DISTRICT 8—NEW OIL PAYS

Crane County, University-Waddell field. Gulf's W. N. Waddell 162, Section 27, Block B-25, PSL Survey, flowed 228 barrels from Devonian lime, Devonian 8475-9150 feet, 12/64-inch, 44-gravity, and 266 barrels from McKee sand, Ordovician 10,110-596 feet, ½-inch, 42.2-

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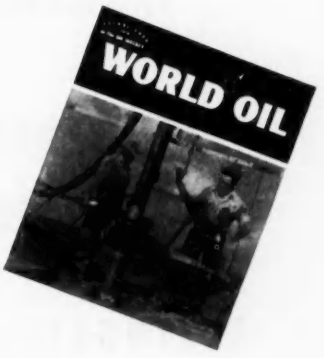

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gravity, completed 5-31-54, TD 10,685.

Garza County, Huntley field. Edwin L. Cox's Huntley 4, H. G. Brandon Survey #4, flowed 154 barrels from Glorieta lime, Permian 4020-27 feet, ¼-inch, 37.2-gravity, completed 6-10-54, TD 4346.

Hockley County, D-L-S field. Stanolind's Dorothy Slaughter 1, Labor 36, League 36, Zavalla CSL Survey, Old Well Worked Over, pumped 73 barrels oil and 23 barrels water from Clearfork lime, Permian 6550-78 feet, 28-gravity, completed 6-19-54, TD 11,010.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Crane County. C. E. Marsh's Johnson-State 1, Section 2, Block B-27, PSL Survey, flowed 135 barrels from San Andres lime, Permian 3220-3300 and 3342-72 feet, ⅜-inch, 33-gravity, completed 6-7-54, TD 5849.

Howard County, Luther, Southeast field. Goldston Oil Corp.'s Morton-Atlas Life Ins. Co. 1, Section 26, Block 32, T-2-N, T&P Survey, 1-mile Southeast Extension, flowed 283 barrels from Siluro-Devonian lime, 9822-32 feet, 2/16-inch, 44.4-gravity, completed 6-22-54, TD 9844.

Luther, Southwest field. Lone Star Production Co.'s Marie Bryson 1, Section 22, Block 32, T-2-N, T&P Survey, ½-mile Southwest Extension, flowed 173 barrels oil and 20 barrels water from Siluro-Devonian, 9903-13 feet, 24/36-inch, 44.5-gravity, completed 6-14-54, TD 9913.

Scurry County, Fluvanna field. Woodson Oil Co.'s George W. Noel 1, Section 517, Block 97, H&TC Survey, ½-mile West Extension, flowed 277 barrels from Strawn lime, Pennsylvanian 7856-59 feet, 23/64-inch, 41.4-gravity, completed 6-7-54, TD 8388.

TEXAS DISTRICT 10—NEW OIL FIELD

Hansford County. Humble's Hitchland Gas Unit 2-1, Section 24, Block 1, WCRR Survey, flowed 136 barrels oil and 6 barrels water from Douglas sand, Pennsylvanian 4531-45 feet, ¼-inch, 39.6-gravity, completed 5-27-54, TD 4545.

TEXAS DISTRICT 10—NEW GAS FIELD

Gray County. Cabot Carbon Co.'s Josie Baker 1, Section 176, Block E, D&P Survey, flowed 4.9 million from Brown dolomite, Permian 2570-89 feet, completed 6-19-54, TD 2589.

TEXAS DISTRICT 10—GAS FIELD EXTENSION

Sherman County, Stratford field. Humble's Stratford Gas Unit 4-1, Section 46, Block 1-T, T&NO Survey, 2½-mile Northwest Extension, flowed 1.6 million from Cisco sand, Pennsylvanian 3428-78 feet, completed 6-10-54, TD 3575.

WYOMING—NEW OIL FIELDS

Carbon County. McElroy Ranch-Natural Gas & Oil & Bruce Anderson's Horne 2, NE NE SW 11-20n-79w, flowed 50 barrels from Muddy sand, Upper Cretaceous 5428-32 feet, completed 6-5-54, TD 5510.

Natrona County. Socony-Vacuum Oil Co.'s F-41-9-G, C NE NE 9-35n-77w, pumped 69 barrels from Dakota sand, Lower Cretaceous 8443-49 feet, 35.2-gravity, completed 6-11-54, TD 8478.

Niobrara County. Great Basins Petroleum Co.'s State 11-16, C NW NW 16-39n-66w, flowed 30 barrels from Newcastle lime, Upper Cretaceous 8456-8665 feet, completed 6-1-54, TD 8665.

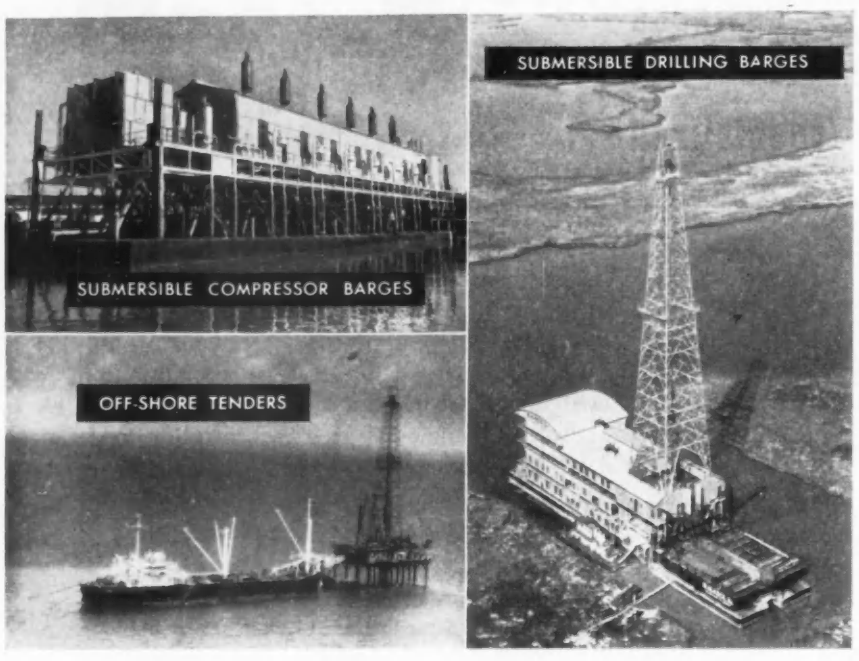
Unnamed field. Northern Drilling Co.'s Vernon Jarvis 2, C NE SW 6-40n-65w, flowed 240 barrels from Newcastle lime, Upper Cretaceous 7408-19 feet, completed 5-26-54, TD 7525.

Snyder Creek area. Great Basins Petroleum Co.'s Government 2-11 Parks 1, C SW SW 11-40n-66w, flowed 57 barrels from Newcastle lime, Upper Cretaceous 7640-7864 feet, completed 5-18-54, TD 7864.

Snyder Creek area. Willey & Stewart's Willey-Government 1, SW NW SW 23-40n-66w, flowed 130 barrels from Newcastle lime, Upper Cretaceous 7750-68 feet, completed 6-10-54, TD 7864.

Washakie County. Pacific Western Oil Co.'s Prescott State 1, SW SW SW 36-44n-92w, pumped 400 barrels from Tensleep lime, Permian 4752-5012 feet, completed 6-1-54, TD 5040.

Weston, Mush Creek area. D. P. Hamilton's Government 1, NE SE SE 2-44n-63w, pumped 20 barrels from Newcastle lime, Upper Cretaceous 3597-3603 feet, completed 5-7-54, TD 3704.



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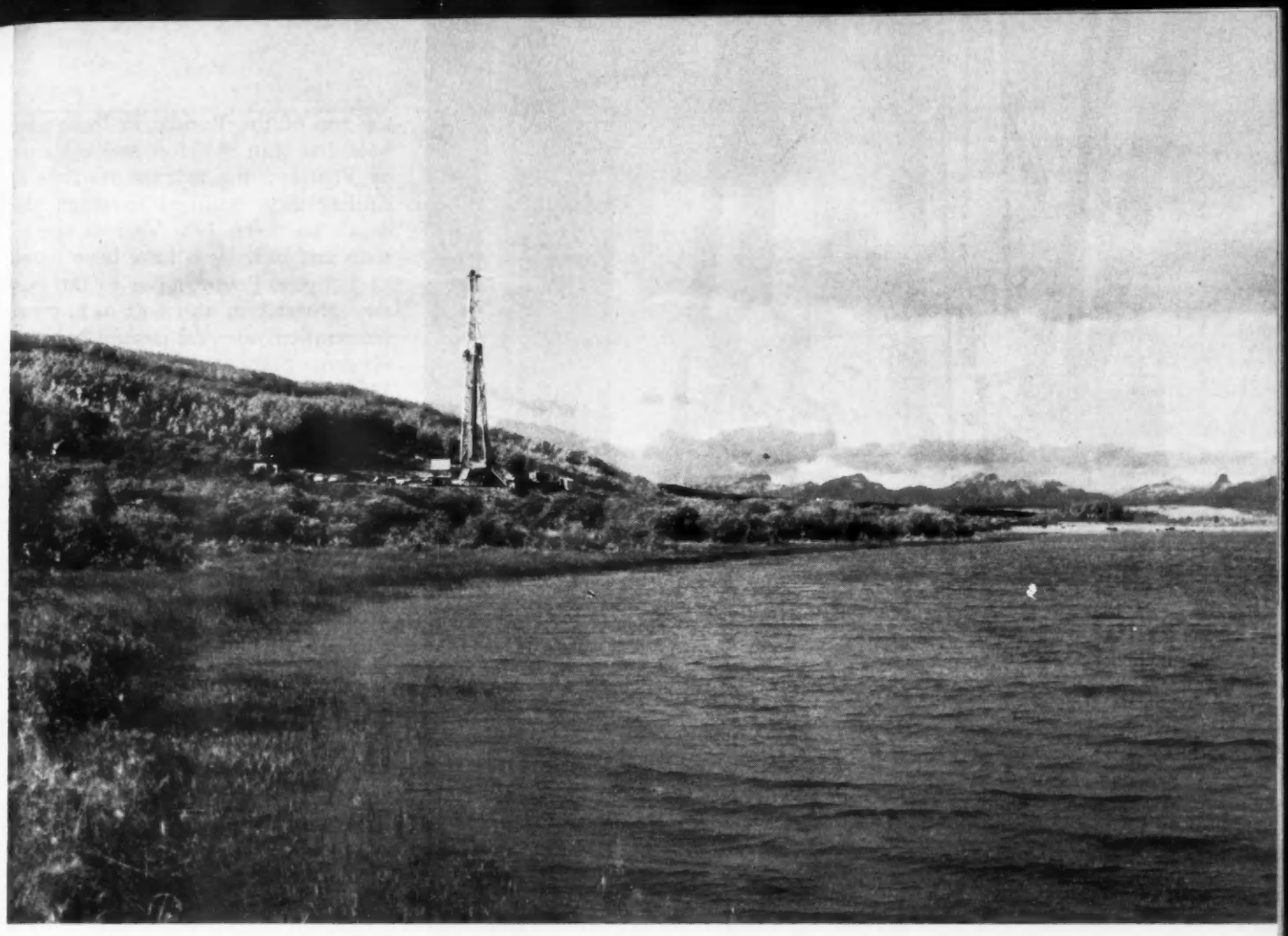


SHELL RIG NO. 1 drilling Unit 12 in the Jumping Pound field of southern Alberta.

In the Canadian foothills . . .

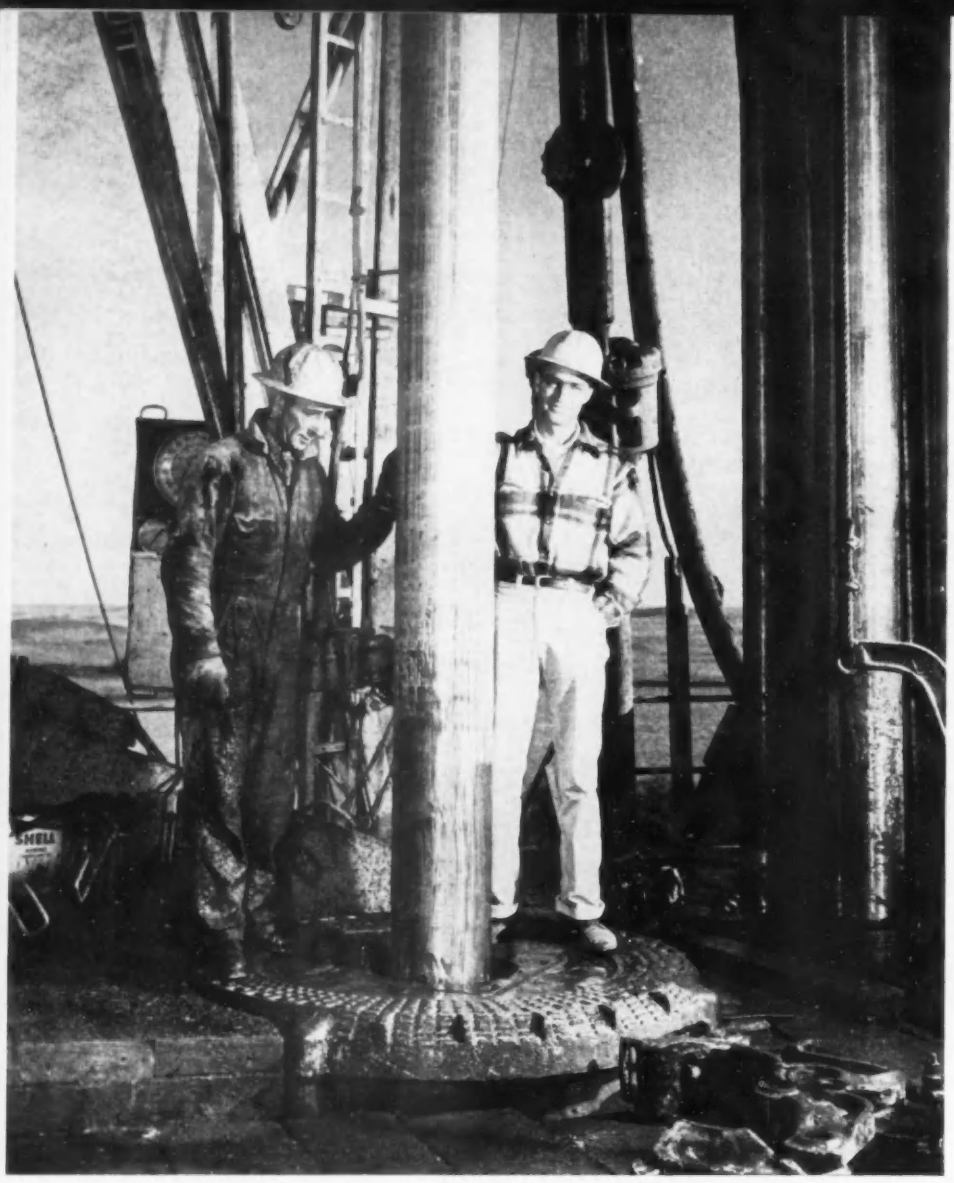
How Crooked Hole Problems Are Solved

Use of 11¼-inch drill collars is improving drilling operations in the steeply dipping formations.

By W. M. BOOTH and F. M. ANGEBRANDT, Shell Oil Company, Calgary

THE FOOTHILLS region of Western Canada is a strip 50 to 75 miles wide extending in a northwest-southeast direction along the eastern flank of the Rocky Mountains, from the U. S. border to the Yukon territory. Several oil and gas producing fields exist in this region. Seismic data indicate the presence of numerous structures which are potential fields. Principal deterrent to foothills exploration and development with the drill has been high cost resulting from crooked hole difficulties. One of the most severe crooked hole problems facing the industry exists here.

Shell's Jumping Pound gas field in southern Alberta presents a good example of difficult drilling conditions in the foothills. The producing formation is the Rundle limestone, of Mississippian age, which is encountered at 9000 to 10,000 feet. The overburden which must be penetrated is Upper and Lower Cretaceous and Jurassic. Complex folding, thrusting and faulting exists in the Upper Cretaceous which extends to 6000 to 7000 feet and according to subsurface interpretation it is possible to encounter any formation dip up to and including 90 degrees in this section. However, available dipmeter surveys show a range of 10 degrees to 64 degrees dip in formations actually penetrated. The competent beds, beginning with the Lower Cretaceous, have a simpler pattern of folding and faulting and normally have dips of



PREPARING TO GO in the hole at Jumping Pound Unit 12. Derrickman A. E. Doan and Drilling Foreman T. J. Mitchell are shown with 11¼-inch drill collars.

the order of 20 degrees to 30 degrees. The drilling problem, then, is resolved in the two phases; first, the medium-soft formations of high, rapidly changing, and unpredictable dips from 0 to 7000 feet must be penetrated; and second, the competent beds of lower and more uniform dip from 7000 to 10,000 feet must be drilled, and the hardness of the rock itself becomes a problem in addition to hole deviating tendencies.

Although Jumping Pound is a gas producing field and is being developed on 640-acre spacing, geologic considerations impose some restrictions on the target area for bottoming the hole. In the over-all picture of foothills drilling, target areas may become very confined if oil columns are encountered and development on closer spacing is undertaken. For these reasons it is essential that technique and equipment be developed for improved penetration rate and better control of the hole so that well cost reduction may be realized.

Industry experience in foothills. In order to determine if any technique used in the past has succeeded in achieving acceptable penetration rate in the foothills, a survey was made of all wells drilled in the region since the discovery well at Turner Valley in 1902. In all, 665 wells were investigated, of which 574 were in the Turner Valley field. The rather discouraging findings of this survey were that only 4 of the 665 wells had over-all progress from spud to completion in excess of 70 feet per day.

In the Jumping Pound field Shell drilled nine wells prior to the instigation of the present experimental drilling program. The average depth to the top of the Rundle in these nine holes has been 9843 feet and as shown by Figure 1 the average number of drilling days required to reach this depth has been 173. Various special tools and techniques have been tested at Jumping Pound, prior to the current program in an effort to improve penetration rate and control hole deviation. Sixty-eight runs totalling 1468 feet of hole were made with a percussion drill in one well. Examination of results showed:

- Penetration rate and bit footage were not significantly improved.
- The percussion drill showed a slight but relatively unimportant tendency to reduce hole angle more readily than conventional light weight on bit technique.

Concurrently with the percussion tool tests, 33 conventional bit runs were made with a special hydraulic tool. This tool was an extendible splined sub just above the bit with a relatively small orifice for mud passage. Weight on bit was applied by mud pressure drop across this orifice. An analysis of these runs show no significant improvement in penetration rate or bit footage, but the tool did show a slight ability to reduce hole angle—less ability than the percussion drill, but more than conventional bit runs without the hydraulic tool.

This survey of competitors' experience and a review of Shell's led to the conclusion that small modifications of past practices would probably produce small improvement in drilling performance. To achieve marked improvement in drilling performance it was evident that radical and marked changes in drilling technique would have to be effected. It is toward this end that the current experimental drilling program is directed.

Current experimental program. A study of all Jumping Pound wells drilled prior to the current program (Unit 1-9) indicated that weight on bit used in the sections down to about 7000 feet was in the relatively light range of 500 to 16,000 pounds for 8⅝- to 9-inch bits. From 7000 feet to total depth weight on bit up to 30,000 pounds had been carried, but only for short periods of time. The significant facts were:

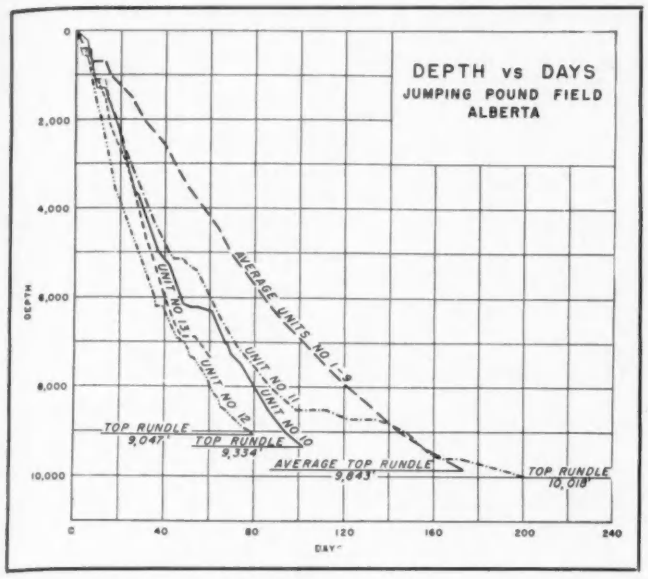


FIGURE 1

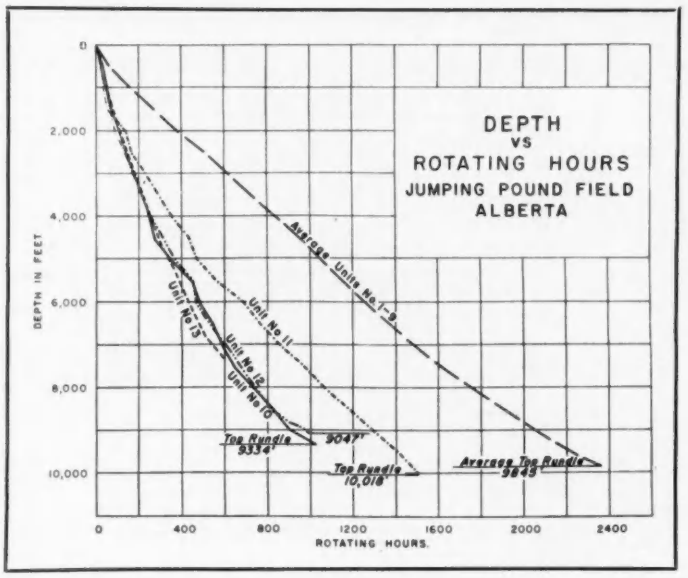


FIGURE 2

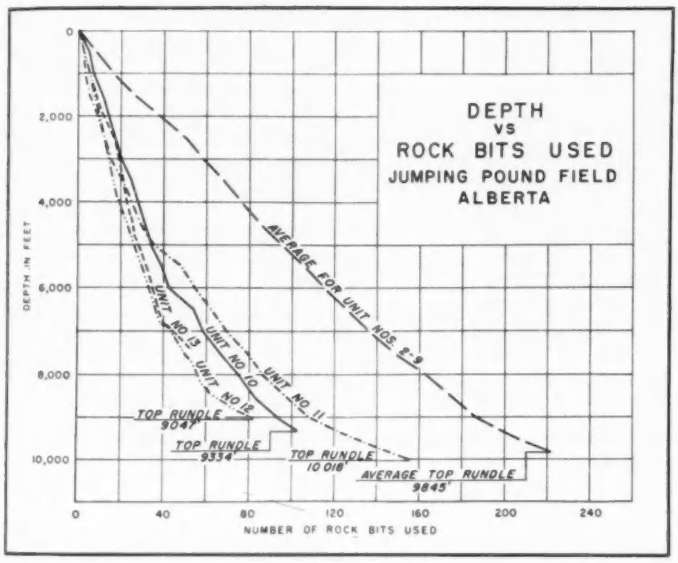


FIGURE 3

• There was no definite trend of hole deflection resulting from small changes in weight on bit.

• Even small increases in weight on bit resulted in penetration rate increase, which agrees with general experience up to the balling point of the bit.

From this study it was concluded that the most lucrative approach toward improving drilling progress was the use of higher weight on bit. Field data from several areas where crooked hole problems exist have shown that oversize drill collars have permitted higher weight on bit without undue increase in hole deflection. The theoretical considerations of Lubinski and Woods[1] and the work of the Mid-Continent District API Study Committee on bore hole drift have borne out the same thing. It was concluded that employment of oversize collars should be the first and most logical approach to achieve the desired increase in weight on bit at Jumping Pound.

How large should the oversize collars be was the next question. After reviewing the work of Lubinski and Woods[1] and considering the severity of the problem, it was obvious that the larger the collars the greater the benefits. Also, field results show that collars one inch smaller than hole size have been run successfully in several crooked hole areas.

Accordingly, it was decided to purchase three 30-foot collars, 11¼ inches in diameter, to run in 12¼-inch hole. These three collars would weigh 24,000 pounds in ten pound per gallon mud and would have stiffness, for example, four times as great as eight-inch outside diameter collars. Jumping Pound Unit 10 was selected as the well to drill with these large collars.

Drilling of Unit 10. The 11¼-inch drill collars were employed in 12¼-inch hole from spud to a depth of 6202 feet, which previous experience indicated was deep enough to get through the intervals where most rapid changes in hole angle occurred.

Oil emulsion mud and 5½-inch drill pipe were used, and mud circulation rate was maintained at 800 to 900 gallons per minute which provided a rising velocity in the annulus of the order of three feet per second. It was found that the oil emulsion was essential to free rotation of the big collars, and the rising velocity also proved to be critical. Tight hole almost invariably resulted when the circulation rate fell below the range mentioned above.

During the drilling of the 12¼-inch hole, experimentation was conducted with various weights on bit up to 70,000 pounds. Hole angle generally increased with an increase in weight, and a maximum of ten degrees was experienced at a depth of 4200 feet where 70,000 pounds was being run on the bit. Weight on bit was reduced to 30,000-35,000 pounds thereafter, and hole angle stabilized between 7 and 8 degrees. Drill collars 7¾ inches

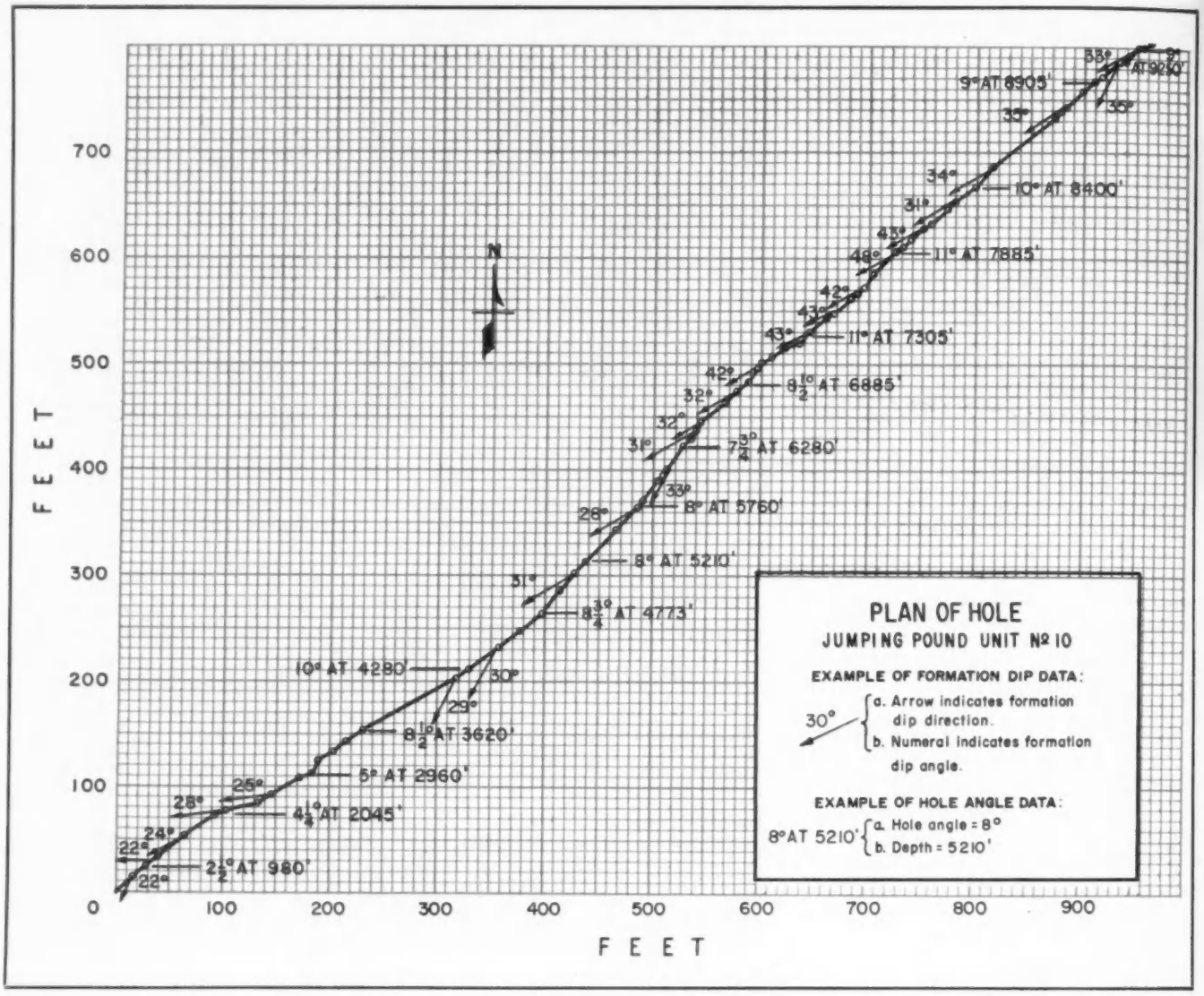


FIGURE 4

in diameter were run above the 11¼-inch collars to supply the additional weight needed.

Penetration rate reached a maximum between 50,000 and 60,000 pounds weight on bit, and fell off at 70,000 pounds, probably due to balling of the bit. Rotary speed was a critical variable with the 11¼-inch drill collars. It was found that the bits ran smoothly at 150 or 50 revolutions per minute, but penetration rate was cut in half at the latter figure. Consequently, the rotary table was turned about 150 rpm. In the range between 50 and 150 rpm, a rough bouncing action was experienced, and bits were destroyed in a few hours due to impact from the large amount of weight concentrated just above the bit.

At a depth of 6202 feet, 9⅝-inch casing was run and hole size was reduced to 8⅝ inches. Drill collars 7¾ inches in diameter were used and hole angle stabilized between 7 and 8 degrees with 30,000 pounds on the bit. At a depth of 7000 feet, 6¾-inch collars were substituted and the same weight on bit maintained to determine if the 7¾-inch collars were really necessary. In drilling 247 feet, hole angle increased from 7¼ degrees to 13 degrees. The 7¾-inch drill collars were placed back in the hole and drilling was continued to a depth of 9334 feet where the top of the Rundle limestone was encountered and diamond coring begun. Weight on bit was maintained between 30,000 and 40,000 pounds, and hole angle gradually reduced to a value of nine degrees at the coring point.

Drilling of Unit 11. Jumping Pound Unit 11 was spudded about three weeks after Unit 10 was begun. At that time the 11¼-inch o.d. drill collars had been used for only the three-week period and no evaluation could be made. It was decided that Unit 11 should be drilled with a drill collar and hole size program intermediate between conventional collar and hole size and the extremely large collar and hole size program being run at Unit 10. It was evident that data should be developed on the performance of this intermediate size program, regardless of how successful the 11¼-inch collars were in Unit 10, since considerable reduction in casing and rig requirements would be realized if smaller hole and collar size could accomplish the same results.

Accordingly, Unit 11 was spudded using 8⅝-inch drill collars in 9⅞-inch hole. At 1000 feet, the hole was reamed and surface pipe cemented.

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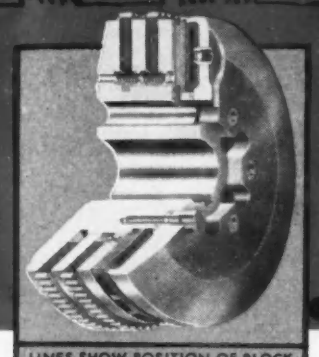

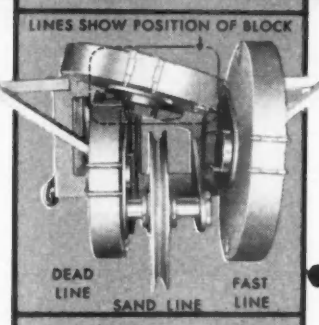

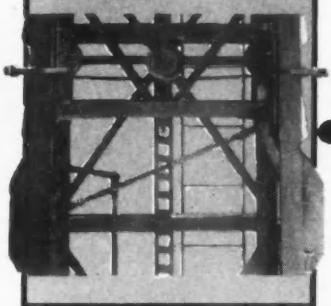

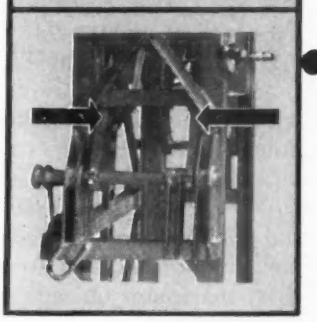

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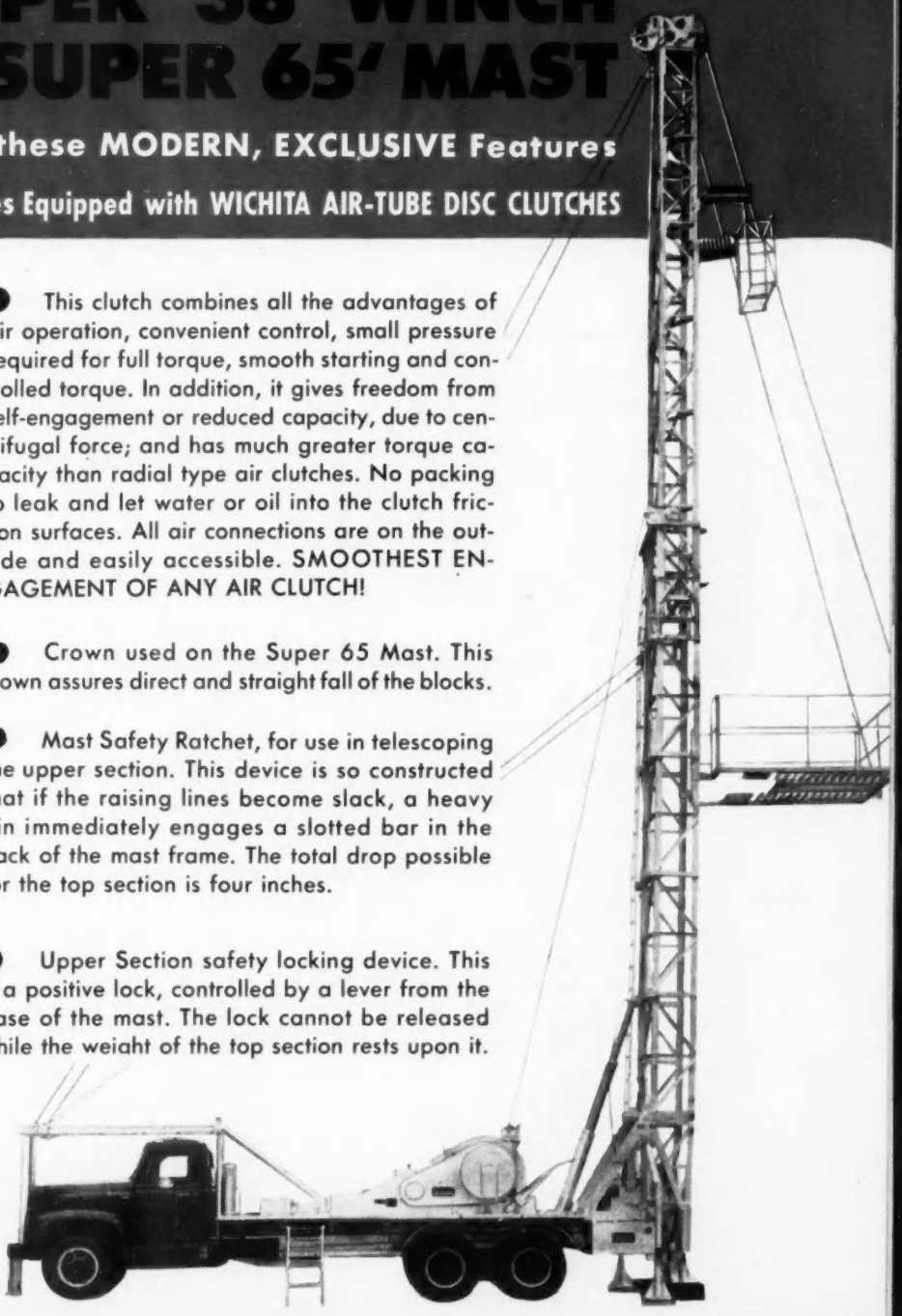
Upper Section safety locking device. This is a positive lock, controlled by a lever from the base of the mast. The lock cannot be released while the weight of the top section rests upon it.



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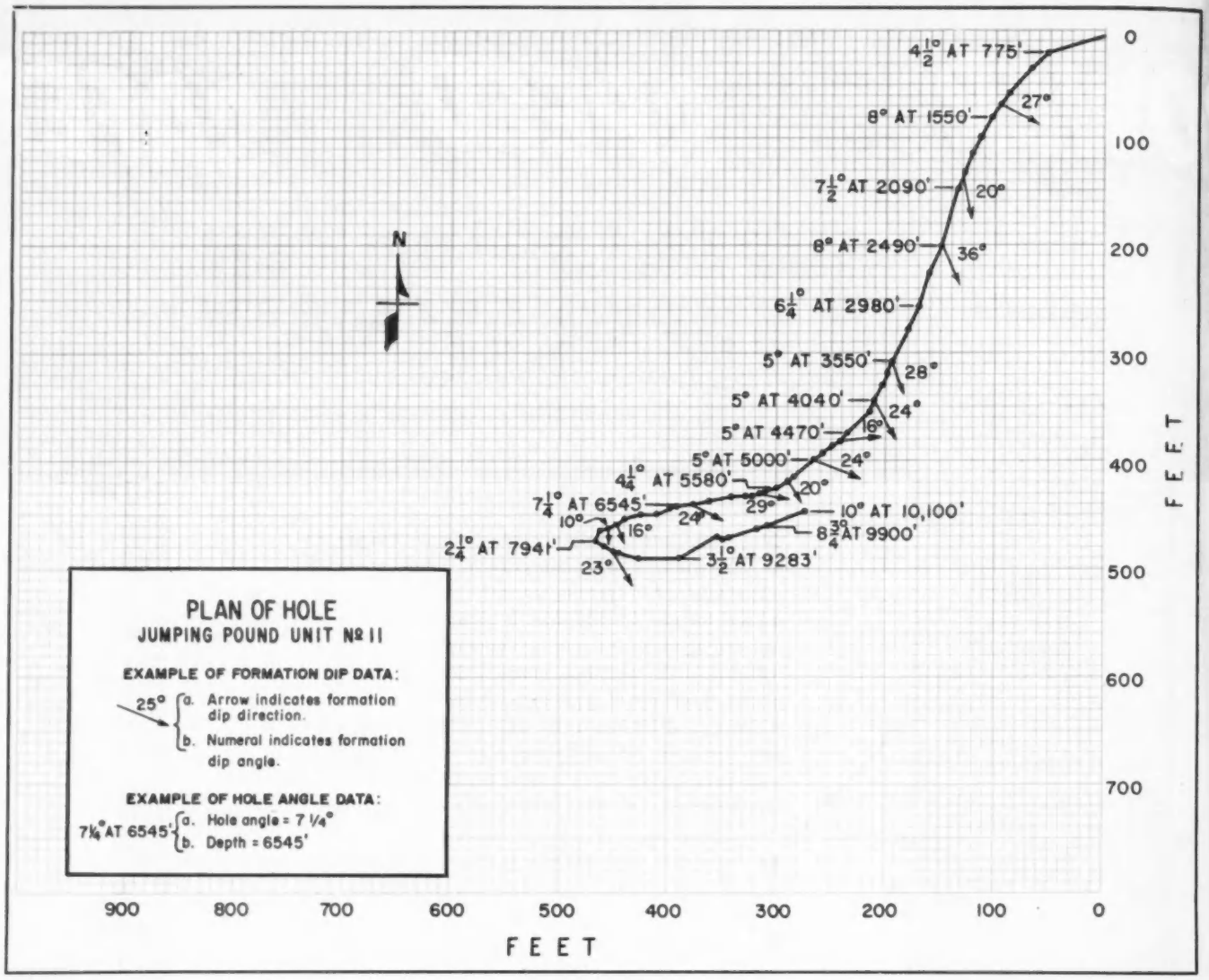


FIGURE 5

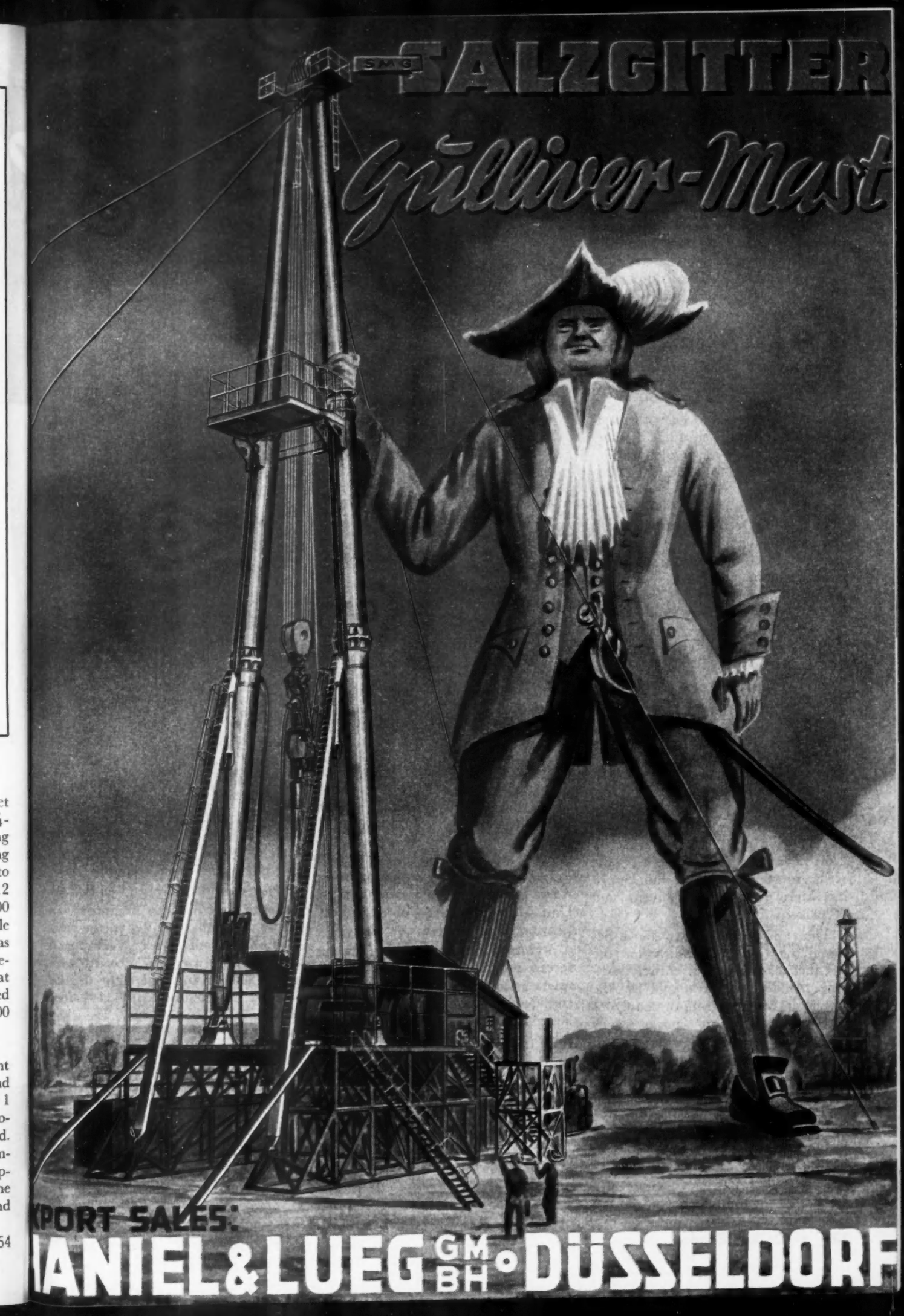
Drilling was continued below surface pipe without unusual difficulties to about 5100 feet. Hole angle increased very rapidly to a value of about eight degrees at 2500 feet and it was evident that this collar and hole size program was more susceptible to rapid changes of hole angle than was the 11¼-inch collar program.

At 5100 feet a piece of iron was lost in the hole and troubles began as can be seen from the curve in Figure 1. Considerable time was lost in cleaning up the hole on this occasion. As drilling progressed keyseating became troublesome in the interval from the surface pipe shoe to 3000 feet, where the more rapid changes in hole angle had occurred. It was in one of these keyseats that the drill pipe became stuck while making a round trip at a depth of 8112 feet. The pipe was recovered and drilling proceeded to a depth of 8700 feet, at which point the drill string was again stuck in a shallow keyseat.

After the drill string was again recovered, hole size was reduced to nine inches in order to avoid the keyseating trouble if possible. Drill collars seven inches o.d. were used in the nine-inch hole and drilling proceeded to a depth of about 9600 feet at which time hole conditions made it imperative to run a string of seven-inch casing. Drilling was resumed with 6⅛-inch bits and the top of the Rundle limestone was reached at 10,018 feet in a total of 201 days. A comparison of drilling performance in this hole will be discussed later.

Drilling of Jumping Pound Unit 12. Unit 12 was spudded after the completion of Unit 10 and evaluation of the 11¼-inch drill collars had found them to be far more advantageous than the 8⅝-inch drill collars in Unit 11. Consequently Unit 12 was drilled to a depth of about 6200 feet with the 11¼-inch collars in 12¼-inch hole, and an intermediate string of 9⅝-inch casing was run. Drilling was continued with 8⅝-inch bits to total depth. Weight on bit in Unit 12 was limited to a maximum of 40,000 pounds and slightly lower hole angle than that experienced in Unit 10 was the result. A maximum of eight degrees occurred at 4300 feet, while at the same depth Unit 10 experienced a deflection of 10 degrees with 70,000 pounds weight on bit.

Results. Figures 1, 2 and 3 present a comparison of Unit 10, Unit 11 and Unit 12 with the average of Units 1 to 9 for total drilling days, total rotating hours, and total rock bits used. The establishment of a basis of comparing an experimental well at Jumping Pound is difficult because the wells are spaced one mile apart and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due to the complex faulting and folding, the sequence and thickness of various sections varies widely from well to well. Since comparison of a well with its offset wells often does not present a true picture, the basis for comparison which has been used is the average curve for Units 1 to 9. This seems to be a fair basis because drilling time has not improved with the drilling of each new well at Jumping Pound; Unit 1 follows the average line closely, and Unit 8, one of the later wells, was actually the slowest in the field.

Summarized, the comparisons shown by the curves are shown in Table 1.

Unit 10, which employed the 11¼-inch drill collars, reduced both rotating hours and number of bits by more than half compared to the previous average, but due to additional casing time and some rig down time, reduced total days by about 40 percent.

Unit 11, which was drilled with 8⅝-inch drill collars, shows a 36 percent reduction in rotating hours and a 30 percent improvement in number of rock bits, compared to the average, but due to the numerous fishing jobs (for everything *except* "packed-hole" drill collars) the total number of days exceeded the average.

Unit 12 employed the 11¼-inch drill collars, and made further improvement over Unit 10. The top of the Rundle was reached in 79 days, which represented a 54 percent reduction from the average for the first nine wells. On bottom rotating time and number of bits used were reduced 58 percent and 64 percent respectively. Even when comparing Unit 12 to the fastest of the first nine wells, rotating time and number of bits were reduced 33 percent and 39 percent.

The comparisons drawn above between the 11¼-inch collars and the 8⅝-inch collars do not entirely indicate the decided advantage for the former in reducing rate of change of hole angle, which of course means less keyseat hazard—the hazard which occasioned most of the difficulty in Unit 11. For example, the most rapid rate of change of hole angle for the 11¼-inch collars was less than one degree per hundred feet, while the same figure for the 8⅝-inch collars was almost three degrees per 100 feet.

Another factor which contributed to the good progress of Unit 10 was the 6200 feet of casing which walled off the most troublesome sections of tilted, sloughing, shales. It is possible that keyseats could have developed in Units 10 and 12 if they had been cased, but it is certain that keyseats would not have been as serious as in Unit 11, since change of angle was less severe as pointed out above.

A final contributing factor to the record progress of Units 10 and 12 was a broadening of geological target considerations, which permitted some horizontal drift of the hole. As a result of data secured in drilling Unit 10, the surface location of Unit 12 was moved to permit the anticipated horizontal drift without missing the objective horizon. The plan view of Units 10 and 11 is shown in Figures 4 and 5, along with formation dip data and hole angle data. It can be seen that Unit 10 deflected up-dip consistently, which is characteristic of most Jumping Pound wells, while Unit 11 drifted in various directions with respect to formation dip, for no apparent reason.

Future plans. The success of large collars thus far has solved a portion of the crooked hole problem in the foothills. Use of 11¼-inch drill collars in 12¼-inch hole is now considered standard practice by Shell, and wells can be drilled in a reasonable length of time if a deflection angle of 5 to 10 degrees can be accepted. The inevitable discovery of deep oil reservoirs in the foothills will necessitate development on closer spacing than the one well per square mile now enjoyed, and so equipment and technique for drilling the holes fast with deflection angles of the order of 3 to 5 degrees must be developed.

Two approaches which can be made are:

- Employ some system of stabilizers in conjunction with the large drill collars.
- Use still larger collars.

Along the first line of approach, 12⅛-inch spiral steel rib stabilizers have been built for use on the 11¼-inch drill collars in 12¼-inch hole, and will soon be tested. Rubber rib stabilizers are being tested now on 7¾-inch collars in 8⅝-inch hole.

The second approach, which appears to have merit, is to employ still larger drill collars. Based on the work of Lubinski and Woods,[1] it appears that in the Jumping Pound wells where a hole angle of eight degrees is now experienced with 11¼-inch collars in 12¼-inch hole, the same penetration rate could be maintained and hole angle held to about four degrees, for example, by using 15-inch drill collars in 16-inch hole.

About the Authors

W. M. BOOTH was graduated from the University of Texas in 1947 after serving in the Infantry in the U. S. Army during World War II. He joined Shell Oil Company in September of that year and has worked on various phases of drilling operations for the company in Houston and Tulsa. His present assignment is area drilling engineer in Calgary.

•

F. M. ANGEBRANDT served three years in the RCAF and in 1952 was graduated from the University of Toronto with a B.S. degree in engineering. He joined Shell Oil Company in May, 1952. He is a mechanical engineer in the Calgary area.

TABLE 1

WELL	Top of Rundle	Total Days	Total Rotating Hours	Total Rock Bits
Avg. Unit Nos. 1-9	9843′	173	2360	222
Unit No. 10.....	9334′	102	1027	103
Unit No. 11.....	10,018′	201	1508	156
Unit No. 12.....	9034′	79	985	82

REFERENCE

[1] "Factors Affecting the Angle of Inclination and Dog-Legging in Rotary Bore Holes," by Arthur Lubinski and H. B. Woods, presented at Spring Meeting of Mid-Continent District API Division of Production, Tulsa, Oklahoma, March, 1953 (WORLD OIL May, June, July, 1953).

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New Material Combats Lost Circulation

- Special jelly provides quick resistance to flow.
- It does not stick drill pipe.
- It maintains quality of mud in system.
- It retains its fluidity for accurate spotting in the zones of loss.

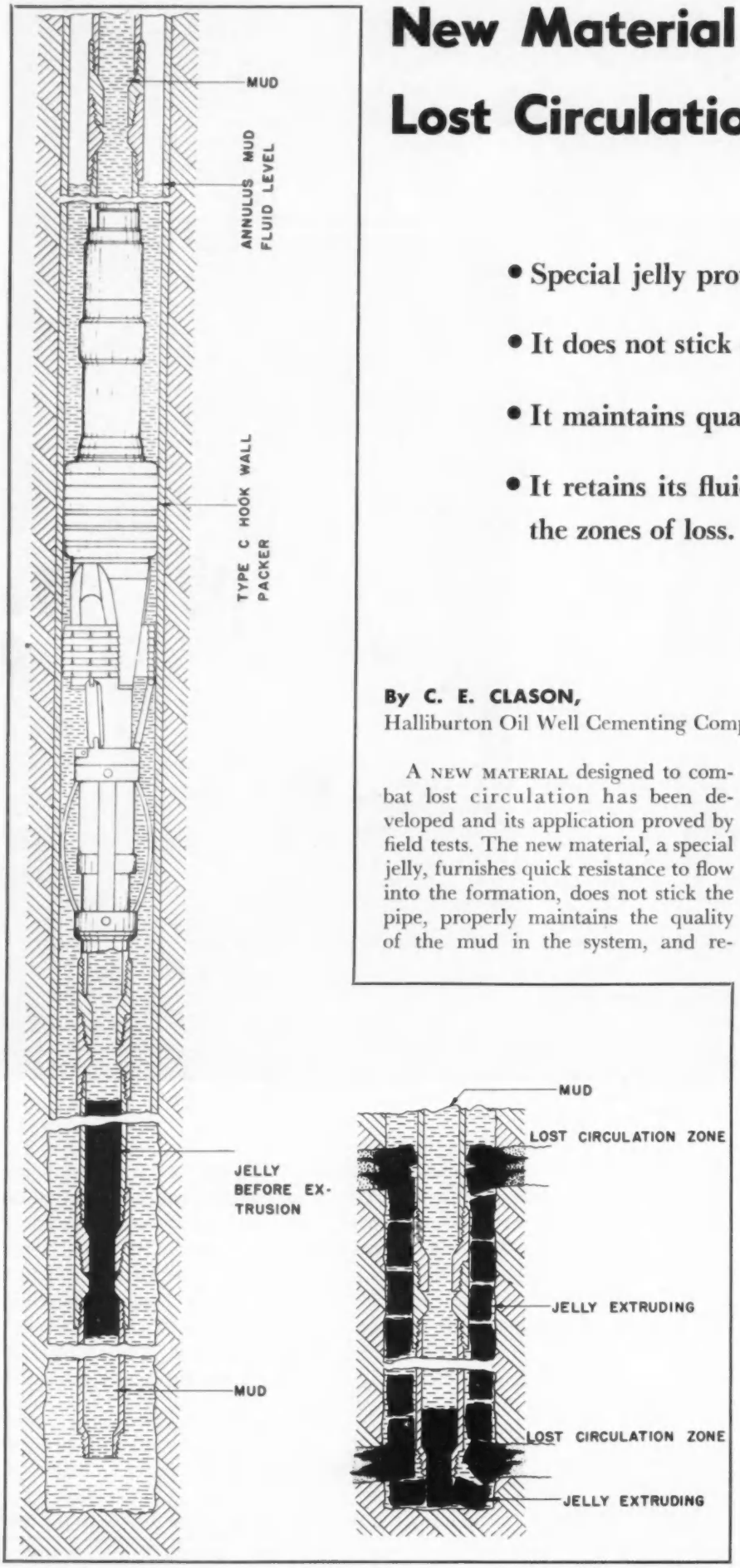
By C. E. CLASON,
Halliburton Oil Well Cementing Company, Duncan, Okla.

A NEW MATERIAL designed to combat lost circulation has been developed and its application proved by field tests. The new material, a special jelly, furnishes quick resistance to flow into the formation, does not stick the pipe, properly maintains the quality of the mud in the system, and retains its fluidity for accurate spotting in the zones of loss.

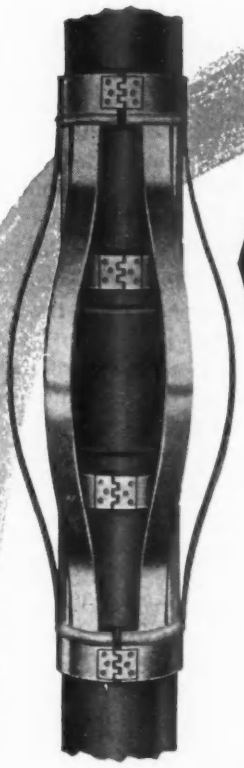
Bugbee[1] mentioned that plugging is achieved by "either bridging at the surface or by accumulation in extended openings or by introduction of viscous material in enough volume to build up resistance, either at once or while waiting on or during a set or swelling."

Needless to say it will probably be impossible to design materials and methods combating lost circulation that will be 100 percent successful at all times and to universally cover all underground conditions. The method of application is sometimes at fault. Any analysis of desired materials must be accompanied by correct handling and application for best results.

It would appear that a quick resistance to flow into the formation accomplished by using a material not apt to stick drill pipe, that will not destroy quality of the mud in the system, accompanied by all possible



Application for lost circulation



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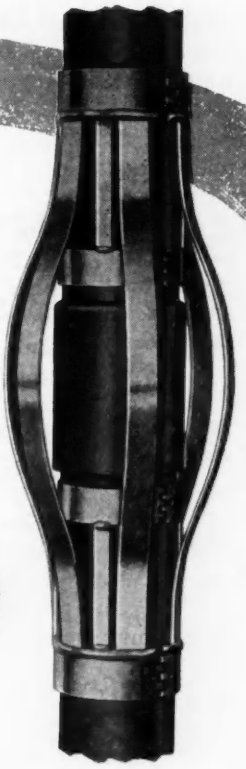
Recommended where LESS-THAN-NORMAL CLEARANCE exists between the casing ON which the centralizers are mounted and the casing THROUGH which the centralizers are run. In cases of over-size or irregularity of the open hole, it is often advisable to run the "H-20" Centralizer on the first few joints—for ease in starting—followed by the "H-25" or the "H-50" Super-Range Centralizer.



BAKER MODEL "H" 25-Range HINGE-LOK Casing Centralizer • Product No. 9113

Recommended where NORMAL CLEARANCE is present, and no serious problem of over-size hole is anticipated. The "H-25" Centralizer is recommended where conditions are such that starting force would be a problem with the "H-50" Super-Range Centralizer, in which case the H-25 might be used on the first few joints and the H-50 run above it. Although the H-50 requires a larger spacing interval for easy starting than centralizers having a smaller range, fewer "H-50" Centralizers—with their superior reach—ensure even greater effective centering force.

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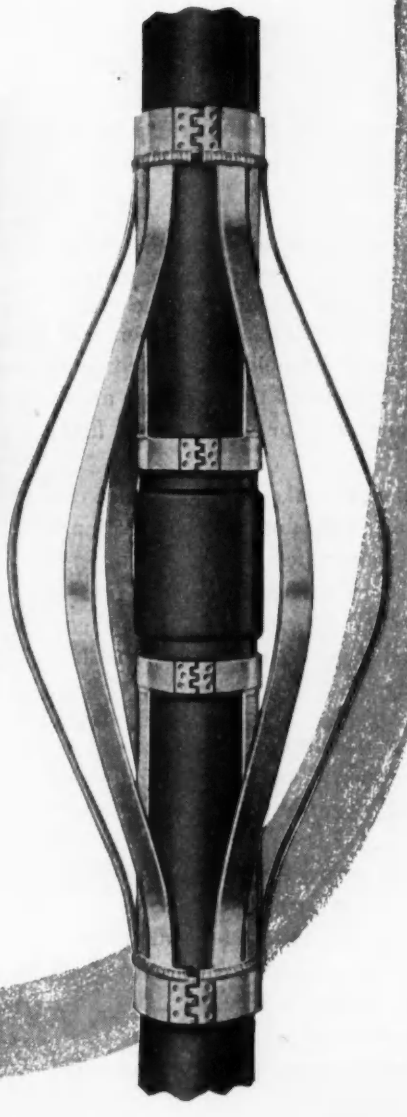

BAKER MODEL "H-50" Super-Range HINGE-LOK Casing Centralizer • Product No. 9114

Recommended for GREATER-THAN-NORMAL CLEARANCE—wherever the diametral clearance between the casing ON which the centralizers are mounted, and the casing THROUGH which they are to run exceeds five inches; or for NORMAL CLEARANCE where extensive hole irregularities are anticipated. No other centralizer can provide such effective centering action as the "H-50" in *irregular or over-size hole sections, or in cavities.* By increasing the bow of the springs (without proportionately increasing their resistance to starting) maximum centering efficiency is assured, regardless of individual well conditions.

means of directing the course of the material to the proper place in the well bore should present a summation for greater accomplishment. The new type of jelly has been developed and will possess the above qualifications, when proper application is used.

Resistance to flow is influenced by viscosity. If the viscosity of a fluid is high enough, it loses fluidity, causing plug flow which requires increasing pressure in proportion to the distance of movement. A soft solid with no fluidity will build up resistance to flow through permeable stratum or crevices much quicker than a far less viscous mixture and will require less volume to obtain a desired pressure.

A material in jelly form with no fluidity must then be extruded in order to enter a crevice or opening. It will penetrate without much rupture except the shearing produced from being forced into openings smaller than the mass. Sub-size particles will pack and squeeze together in tortuous permeable sections.

To obtain extrusion, the jelly must be formed before it is placed in the well bore. By proper manipulation this can be done inside the drill pipe or where possible, inside a string of large or surface pipe.

Two methods of application are in use. Regardless of method, the necessary admixture is mixed in the tanks of a cementing truck. With open end drill pipe in the hole, the ingredients are forwarded into the drill pipe after about one hour or when jelling first starts.

Samples are taken in paper cups or any handy container for observation. Pump pressure tests are made at intervals until sufficient pressure indicates jelling is sufficient. It is then displaced out of the drill pipe by pumping mud.

Positive entrance of the jelly into the formation can only be achieved by having the annulus full of mud. By closing the rams, where present, this often occurs by the time the drill pipe contents are all displaced, provided the jelly has taken some effect.

With the drill pipe near bottom and with a lowered fluid level it can be possible for the jelly to pass upward bypassing a zone of lost circulation before enough pressure head is built up to force it out at this point.

By shifting over and pumping mud into the annulus with closed drill pipe, it will be forced down again, but this is a hit-and-miss method.

The best method is to run a packer on the drill pipe, placing it in surface pipe just below static fluid level. The annular space is then full at the start and the jelly must follow the fluid stream to the point or points of lost circulation regardless of where they are. In this case the jelly is forwarded into the drill pipe before jelling, to a point just below the packer in order to avoid cutting it to a smaller diameter by passage through the packer mandrel which is less than the I.D. of the tool joints. Packers are available that will sustain the weight of 10,000 feet of 4½-inch drill pipe.

Some pressure indicative of a good jelly, is always found when movement is started from the drill pipe due to the restrictions of the tool joints. This decreases as the column moves downward. The material can then be pumped to a desired pressure above that of the fluid column or equivalent to that of future heavier mud.

There can be situations where the jelly is allowed to jell in the casing. If lost circulation appears a short distance below surface pipe or an intermediate string, it is possible to forward it into the pipe onto the mud column or actually forcing the mud ahead to make room for the batch. This larger than usual jelled mass is then pushed down and extruded. Any extra material left in the hole is easily penetrated and broken up for circulation with no harm to the mud.

The material when extruded from drill pipe will be the diameter produced by the tool joint size. Pieces several inches in length are made by the change in direction of flow or by interference of the boundary of the bore hole and these flow upward as the case may be, past the exterior side of tool joints to the zone of lost returns.

The special jelly never sets any harder than a jell-like consistency. It is used with no other fillers or additives and has helped in getting successful jobs by aiding other materials applied later.

Records of field usage show high percentage of success in some areas and less in others. There has been too much inclination to accept the idea that as long as it is put into the hole it should produce results regardless of further technique. Many of the jobs have been done without a full fluid column, some of the material bypassing zones of fluid loss and not being extruded before operations ceased.

It would appear from the records that successful jobs have been obtained in some adverse circumstances that speak well for the material in spite of the way it was used.

In work so far, the largest single batch was 1200 gallons. In one case a second 1200-gallon batch was immediately prepared because pressure requirements were not obtained with the first treatment, and got results. All of the work so far indicates that pressure can at times be built up with far smaller amounts of material than usually used for the purpose. It also indicates that with more control of the fluid flow, such as with proper use of a packer, the material will have better chances of success than has been shown. It would seem that the importance of directional control with this material is similar to requirements for packers in squeeze cementing and just as necessary.

Bonding strength of the jelly to pipe is very low and first resistance to movement is proportional to the number of tool joints through which pressure must be exerted. At times it has required as much as 2000 pounds. This means that a large mass and volume can easily be forced out of straight pipe and extreme cases of lost circulation should be considered for possible use in this manner.

Undoubtedly there are extreme conditions where difficulty with any material or methods will be encountered but it is believed that the special jelly offers some distinct advantages and adds to the growing choice. If the desired pressure can be built up, drilling can be resumed with no further delay or mud conditioning and it is very easy to repeat the operation if the first trial is unsuccessful.

REFERENCE

[1] Lost Circulation Can Be Avoided or Minimized, J. M. Bugbee, Shell Oil Company, API, Fort Worth, March, 1953. WORLD OIL, May, June, 1953.

—The End

WHAT CAN A MINE TELL YOU ABOUT MUD?

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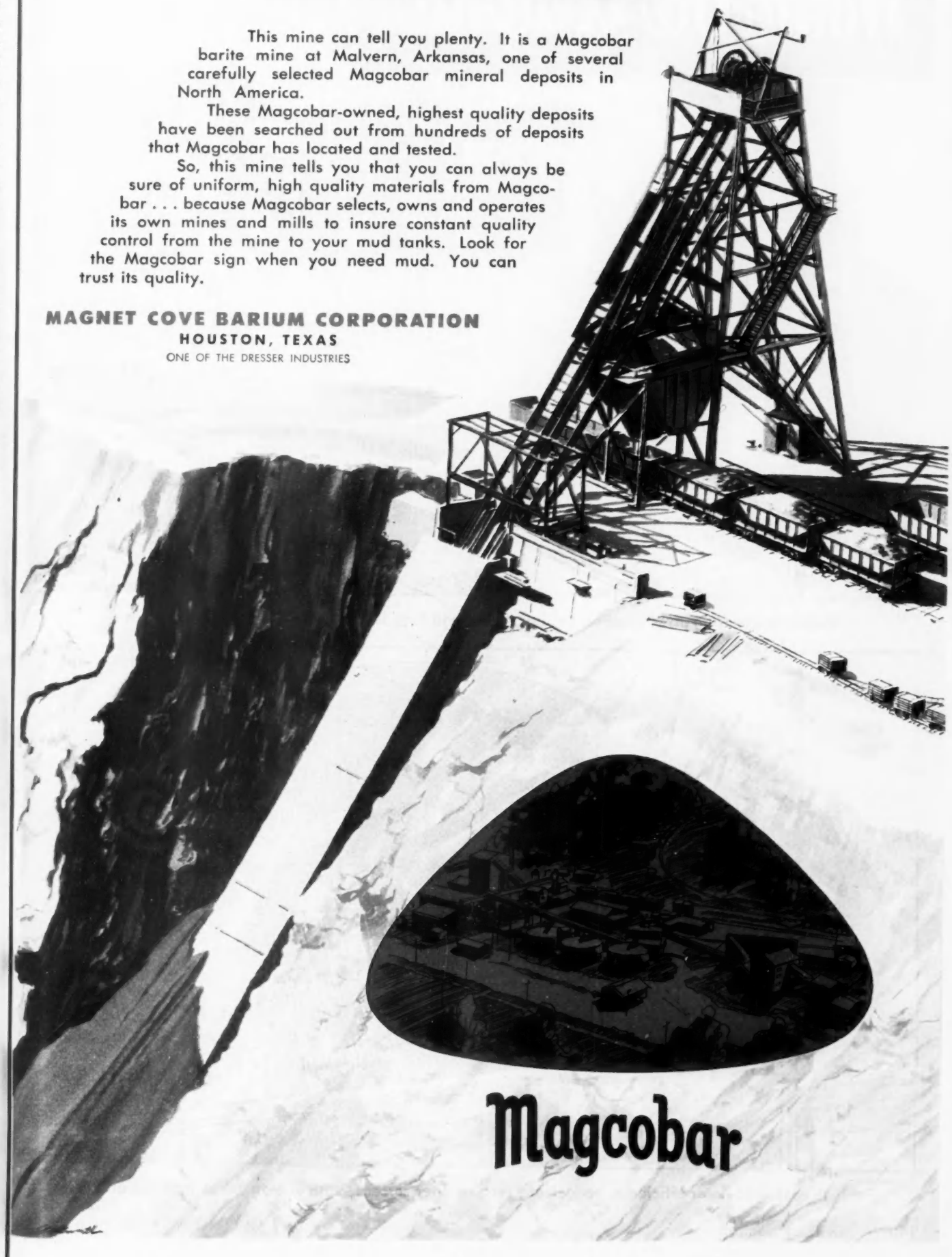
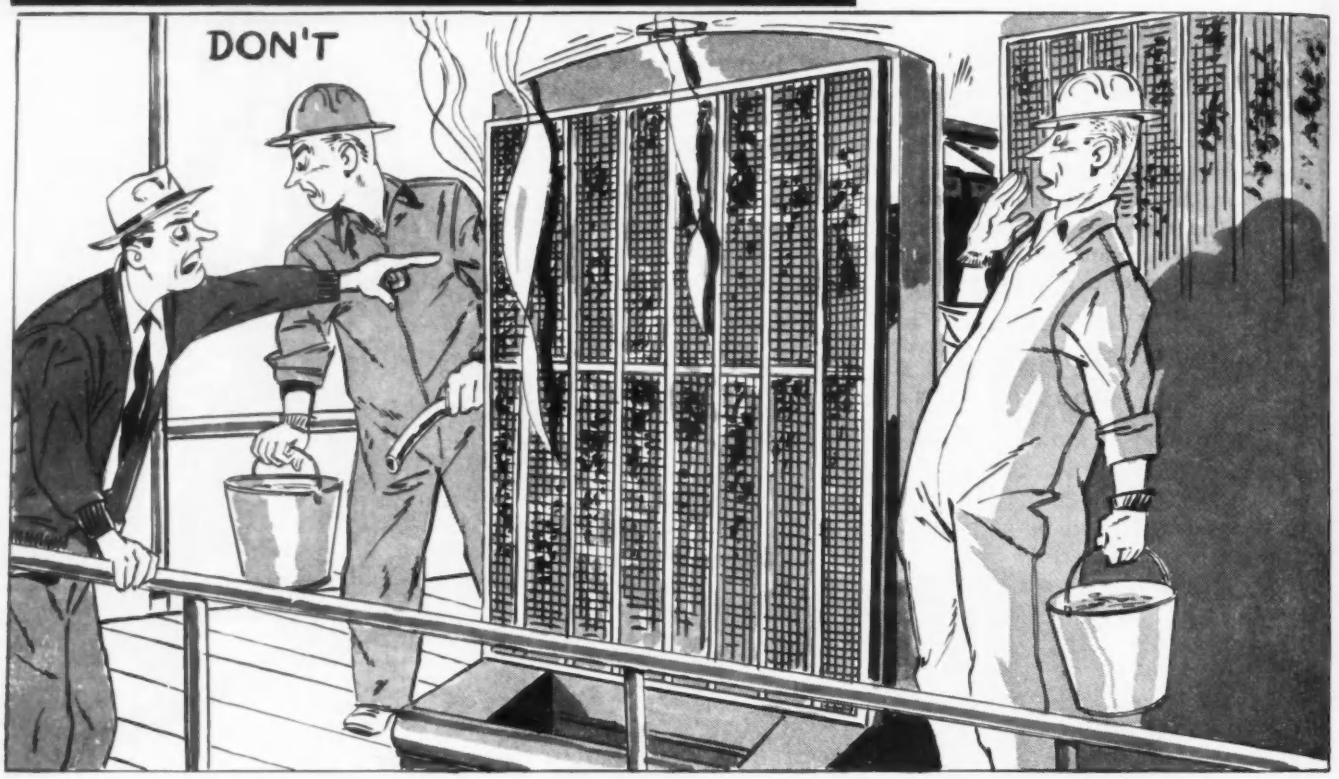


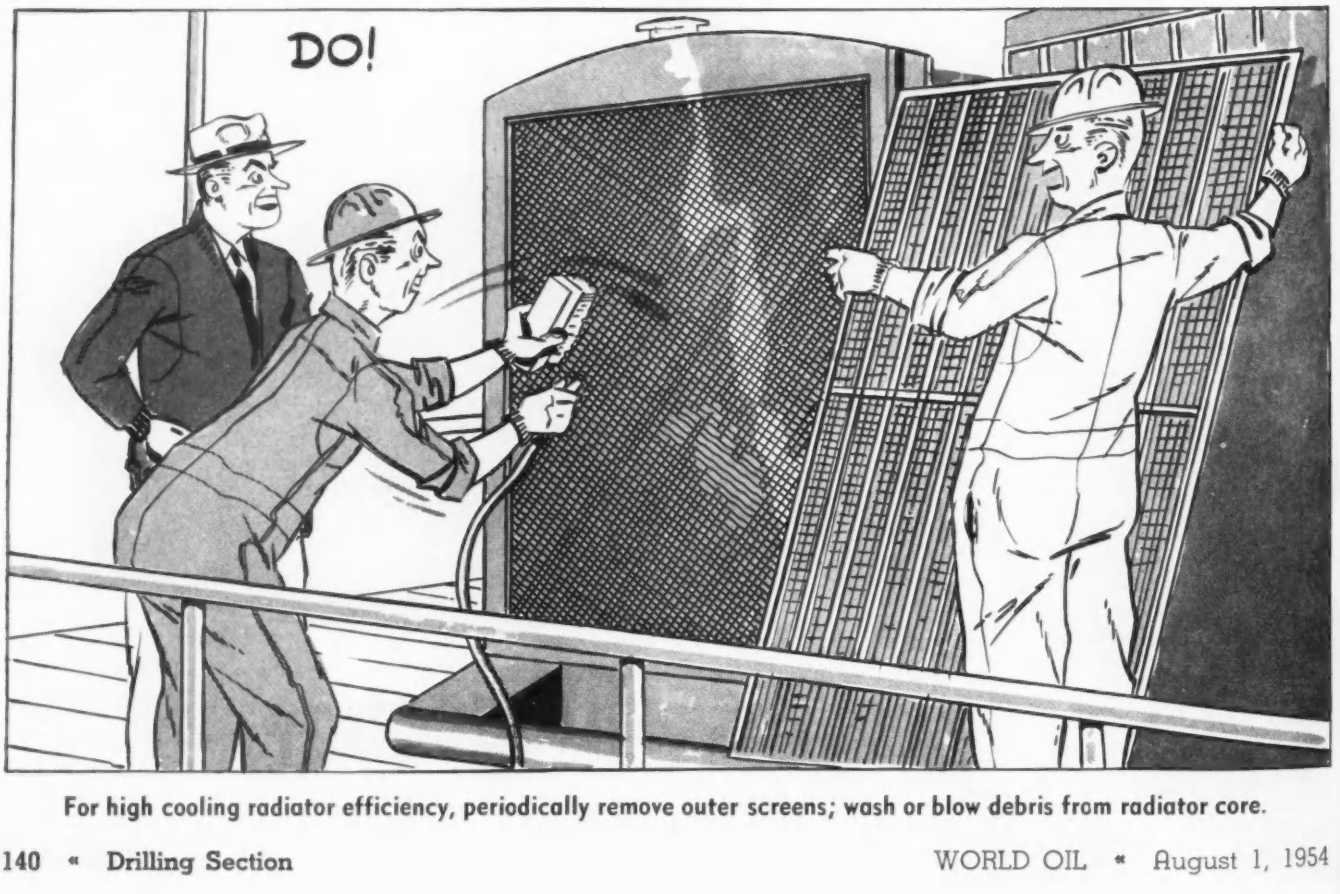
Magcobar

World Oil Graphics

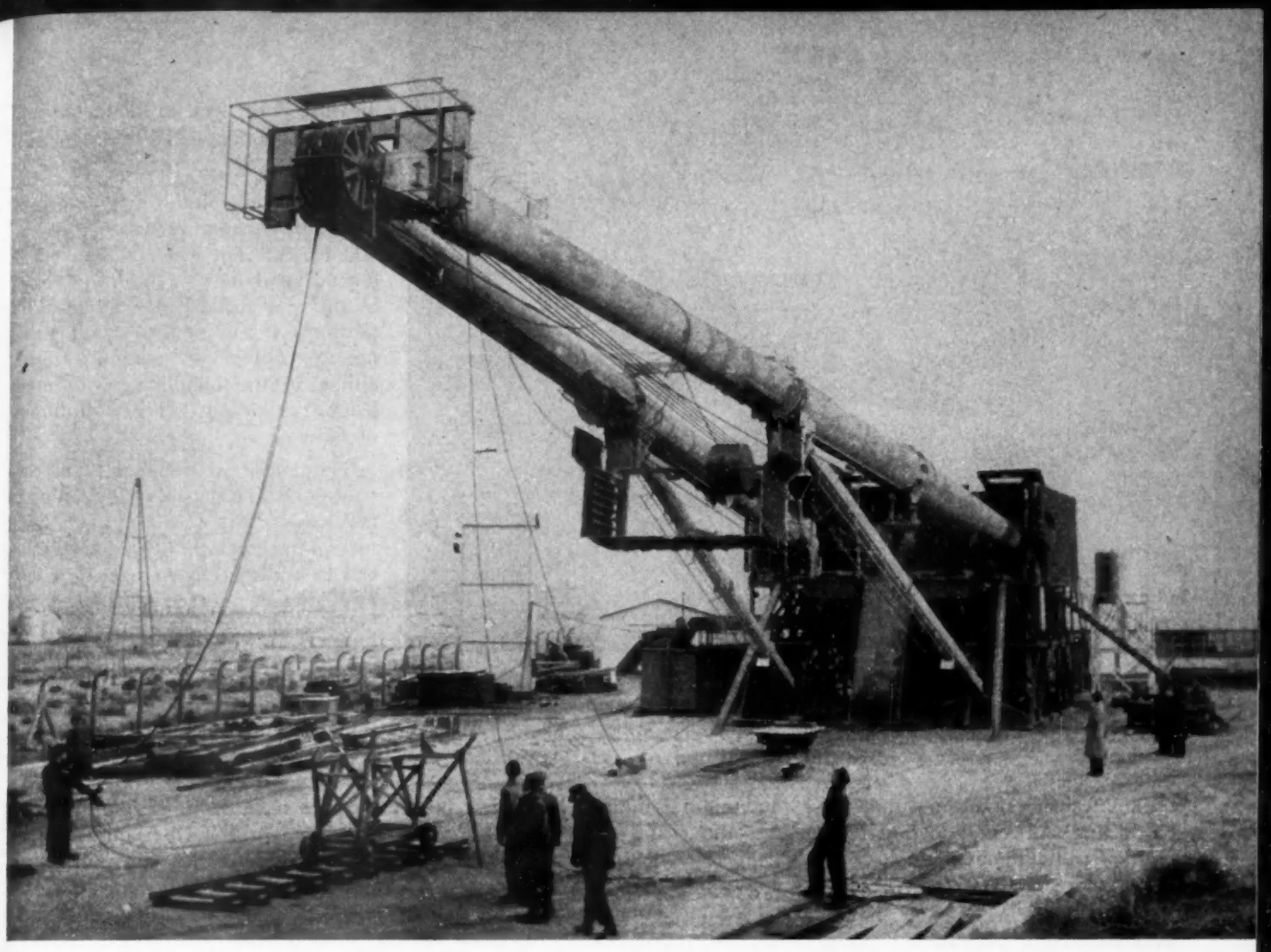
Cooling System Care



Engine overheating often is caused by dust, debris and bugs lodging between radiator cooling fins.



For high cooling radiator efficiency, periodically remove outer screens; wash or blow debris from radiator core.



RAISING THE MAST. Mast is being raised into position in conventional manner after being completely assembled in a horizonal position.

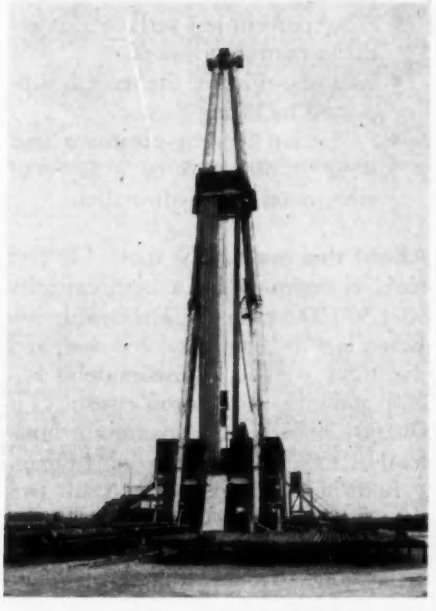
Germans Come Up With New Cantilever Drilling Mast

Shell-type structure is designed to withstand 1.3 million-pound load capacity. It's lightly constructed and easily transported.

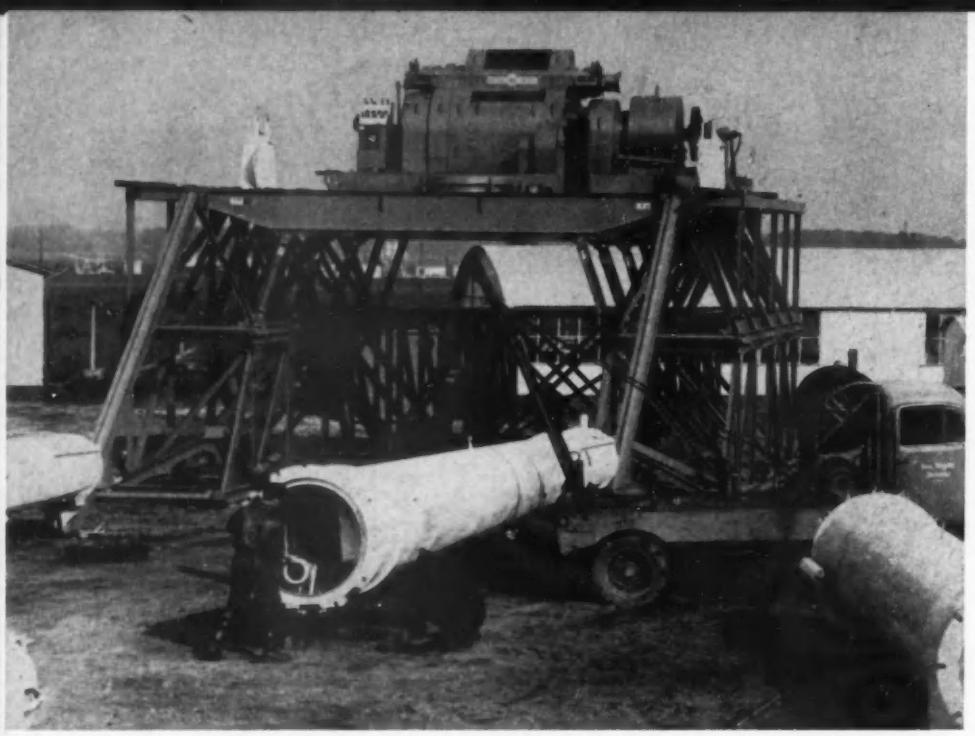
By ERICH BAHKE, Chief Design Engineer
Salzgitter-Maschinen A.G., Germany

A NEW CANTILEVER drilling mast fabricated of light tubular steel has been designed by Salzgitter-Maschinen of Germany to provide lightweight structures for deep drilling. The mast easy to assemble and transport, yet has maximum rigidity for absorbing shock loads.

In an attempt to achieve maximum strength for minimum weight, a shell-type structure, common to aircraft design, was used to offer a high degree



ON LOCATION. An 8000-foot well was drilled recently near Hanover, Germany, with excellent results.



ASSEMBLING THE MAST. The 15-foot substructure is assembled by mounting a triangular-shaped section onto a rectangular base designed to minimize torsion and bending. Single mast sections are positioned by attaching winch line to lifting lugs. Each section is properly aligned with the next by sighting down lifting lugs. Conical guides at each flange simplify assembly.

of stability when operating under eccentric and horizontal loading. This design permitted maximum load capacity and rigidity for the least amount of material.

Outstanding features are:

- The shell structure provides the smallest transport volume for a maximum load capacity.
- The tubes offer low resistance to the wind.
- High yield steels have 0.2 percent carbon content, resulting in reduced weight.
- Forty percent less surface area reduces corrosion attack.
- First one-third of the mast is supported by lifting legs.
- Protection against corrosion and wear is provided by a layer of zinc metal and hydronalium.

About the mast. The mast, 133 feet high, is designed for a load capacity of 1,300,000 pounds. The width between legs is 24 feet and 7 inches, and the total weight approximately 44,000 pounds. The cross-capacity is 660,000 pounds at a maximum hook load of 550,000 pounds, using 10 lines.

Both mast legs consist of two tubular, tapering columns forming an "A" shape at the crown. Both legs can be ascended from within by ladders. The racking and crown platforms are accessible through hinged steel doors. Tong counterweights, electric wiring, and mud standpipes have been built into the legs.

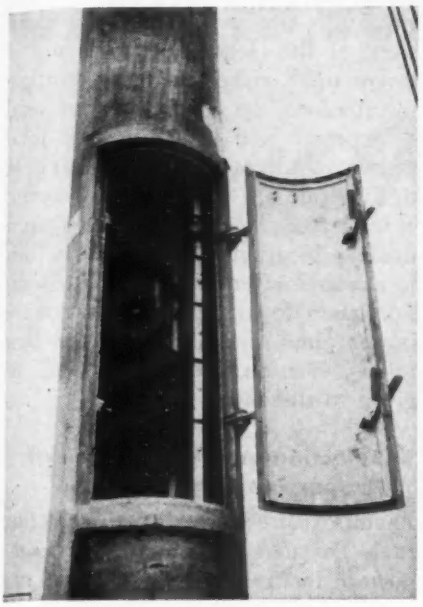
Special shell-type stiffners at the crown add materially to the stability of the mast, since forces imposed at the three points of support on the axle of the sheaves are distributed uniformly to the legs. The sheaves measure four feet in diameter and will accommodate 1⅛ and 1¼ inch wire rope.

The racking platform is automatically adjustable and a capacity of 16,000 feet of pipe may be stacked. A second auxiliary platform is provided in the rear for drill collars. A third platform is automatically adjustable up to 12 feet for running casing, aiding in the handling of different lengths of casing within a minimum of time.

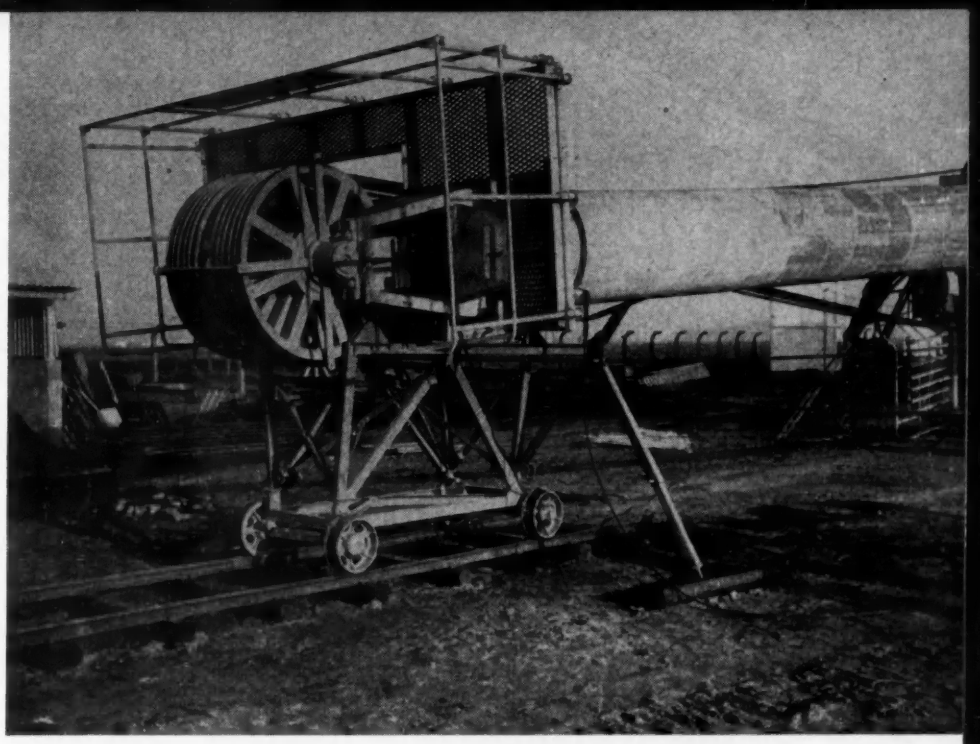
The mast is designed for easy transport. The mast can be hauled in two loads of three sections each. Each section, measuring 43 feet 1 inch long, can be transported on a set of wheels as pole-trailers since each weighs only 5500 pounds. By loosening the locking bolts, the two legs are still linked together at the crown and transport of the complete mast or of both top mast sections including the crown is possible.

How to assemble. The substructure is erected first. Two triangular main substructure sections are pulled into position by mounting ramps onto the main rectangular substructure base. The rig flooring platforms are brought into place and bolted to the main beams.

FLANGE-CONNECTIONS. All joints of the mast are flanged together to assure rapid assembly. Bolts hold flanges together in compression. Comparative size of the mast legs at taper joint can be seen here. Rig lights are at right of worker.



DOORS IN LEGS. Most accessories are built-in. Stand pipe lines, counterweights, ladders, lighting system are inside tube legs.



CROWN BLOCK. Crown block has seven heavy steel sheaves mounted on roller bearings. The catline and sandline sheaves are built inside the crown block construction. Finally crown block is laid on a special dolly on tracks. This supports mast during assembly and erection. A central lubrication system is provided from inside crown door.

Single mast sections are assembled horizontally on the ground, after being swung into place by lifting lugs and supported on saddles. Conical guides at the flange, and transport lugs aid alignment. Flange connections are provided with quick action stress transmitting locks, which recess into the ribs of the opposite leg during moves.

Raising the mast. The completely assembled mast with crown and traveling block are reeved, the power being supplied by the drawworks. The blocks are anchored to the substructure by an auxiliary line. As the drawworks tightens the fast line, the mast slides over the tracks of the mounting channels up to the mast shoes. The raising line is then passed through the A-frame leg supports and through the traveling block. The supports are folded in the mast slide rails. As the fast line is pulled, the mast is pushed upward into operating position where A-frame leg supports are locked to mast.

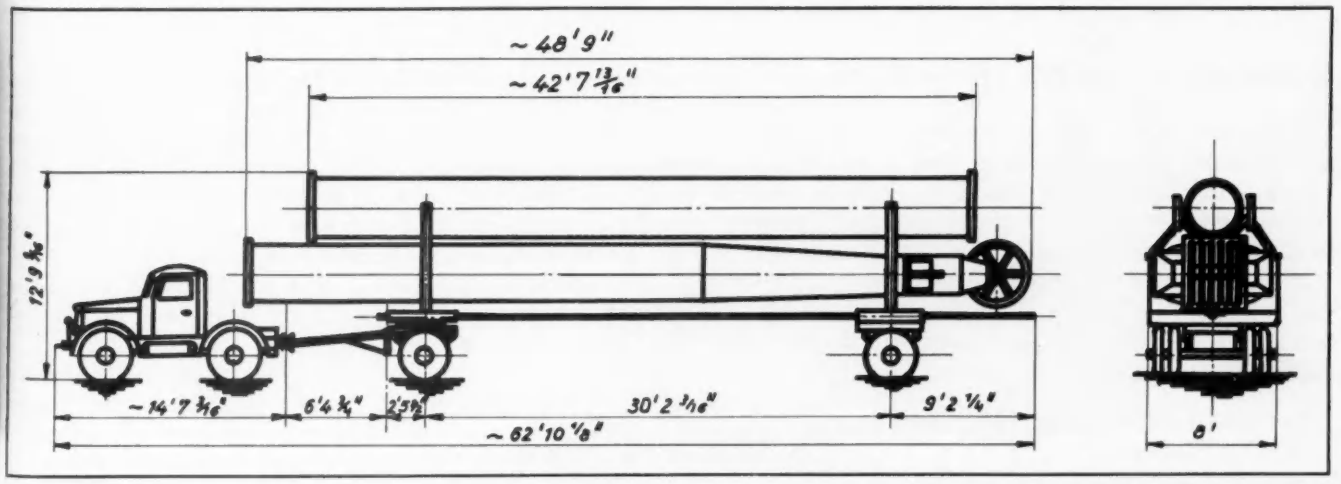
Other features. The mast provides excellent visibility and clearance.

Spark-proof lights diffuse the light broadly from the round leg surfaces, permitting safe night operations.

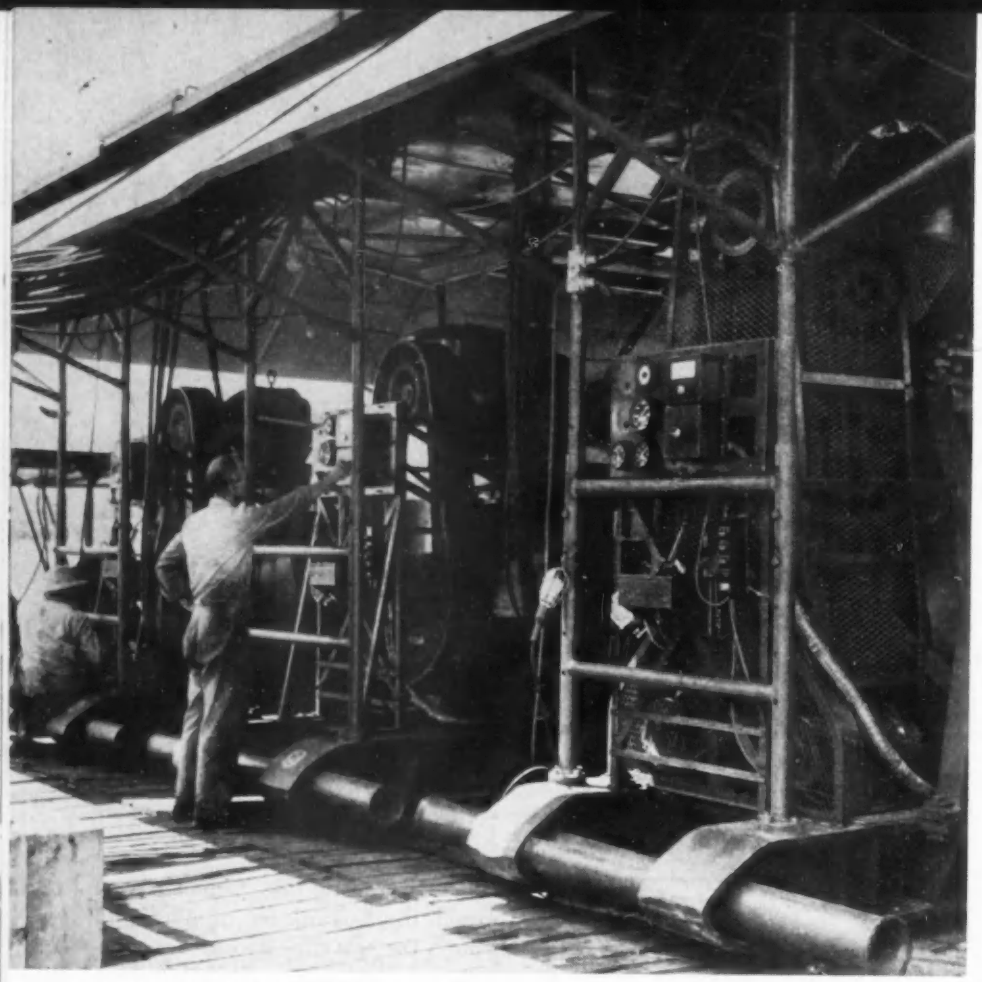
Transport and reassembly charges can be held down, since minimum rigging in the mast including mud piping and electric wiring, are necessary. —**The End**

About the Author

ERICH BAHKE, chief designer, Oil Field Division, Salzgitter-Maschinen A.G., Germany, has had considerable experience in the design of lightweight structures. He was graduated from the Technical University of Danzig in 1939. During World War II he worked as a structural design engineer with a German aircraft company. He turned to the oil industry after the war and has devoted much of his time to promoting the light design of all types of oil field equipment.



TRANSPORTATION. Mast is constructed in three major sections, easy to disassemble and transport where an eight-foot clearance is required. Complete mast with all raising tackle assembled can be transported as a unit.



GENERAL ENGINE INSPECTION will reveal corrections and adjustments that should be made. If neglected these conditions could mean major maintenance problems.

Hints for Operators of Modern Diesels

Here are some ideas on five important points that will go a long way toward providing uninterrupted power on the diesel rig.

By EDWARD B. RAWLINS, The Cooper-Bessemer Corporation

THE USE OF any multi-engine power unit imposes the problem of proper care and maintenance to assure the continuous source of power necessary to a successful operation.

A few points of care and maintenance which will go a long way toward providing uninterrupted power for the diesel rig are:

1. Selection and preparation of proper fuels.
2. Proper maintenance of fuel injection equipment.
3. Proper lubrication which includes selection of proper lubricating oil and maintenance of that oil.
4. Proper filtration of both the lubricating oil and combustion air.
5. General engine inspection and housekeeping.

Modern drilling operations recognize the economies and reliability of the diesel engine as a source of power for their various needs. Diesel engines of the smaller sizes have been used for many years as a source of power on small rigs and as auxiliary power on some of the larger ones. The use of larger units, either single or multiple installations, up to several thousand horsepower and supplying the total power requirements of the largest drilling rigs, are comparatively recent.

It is recognized that engines on a drilling location operate under different and often more severe conditions than do engines in the stationary power plant. In the discussions that follow, due consideration will be given to this fact.

1. Selection and Preparation of Proper Fuels

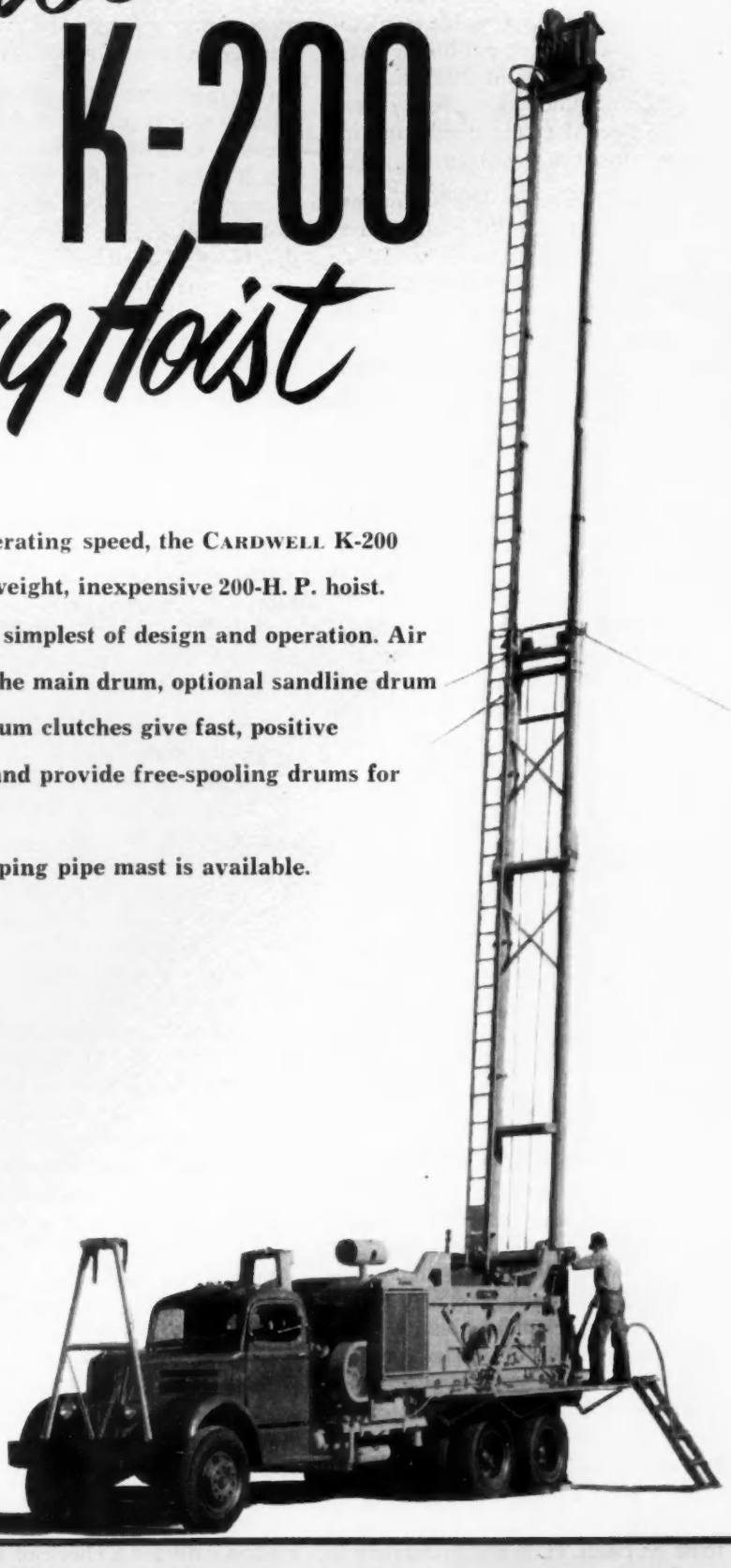
Factors to consider when selecting fuel. The use of good fuel is an important factor in successful diesel operation. ASTM-D-975 1D or 2D fuels provide a dependable uniform fuel for smooth operation. Often however, for one reason or another fuels such as these are not readily available. It may then be desirable to use an available crude, or possibly gas.

Since we are concerning ourselves only with liquid fuels, we will consider those points that should be looked for in the selection of fuels that will contribute to satisfactory diesel operation.

GRAVITY—Any crude fuel selected should not be too heavy; that is, it should have a fairly high API gravity. About the minimum that could be expected to give reasonably satisfactory service without special processing equipment would be an API gravity of 30°. This, however, cannot be taken as a fixed figure as there are other factors that might exclude gravities this low, and by the same token permit the use of some even lower. It is given as an arbitrary average minimum figure.

VISCOSITY—Any fuel selected should have good viscosity characteristics. Any viscosity between 35 and 75 Saybolt Seconds Universal at 100° F. should be able to satisfy the requirements of the lubrication of the injection system, and yet atomize properly in the combustion chamber. Viscosities of less than 35 seconds will lack necessary lubricating qualities for the injection apparatus. Those more viscous than 75 SSU probably would require some heating to reduce their viscosity to the proper point. Crudes and fuels containing a lot of wax may have to be heated in order to keep the wax in

CARDWELL Announces the New K-200 Servicing Hoist



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The design of the K-200 embodies the simplest of design and operation. Air controls operate the air friction clutches in the main drum, optional sandline drum and rotary drive. CARDWELL air friction drum clutches give fast, positive engagement under all operating conditions and provide free-spooling drums for fast dropping of the block.

A 65-foot or 55-foot double leg telescoping pipe mast is available.

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solution and enable the fuel system to handle it.

COMBUSTION—A distillation check is useful in indicating the combustion characteristics of a fuel. It should not contain a lot of heavy ends that will not distill off at a reasonable temperature. A fuel of this type should distill at least 90 percent at 700° F. as a maximum figure. More heavy ends than this could create nozzle and injection equipment troubles.

SULFUR CONTENT—The sulfur content of the fuel should be checked to ascertain that it is not excessive. While modern diesel engines with the proper lubricating oils give good service with the higher sulfur fuels, a sulfur content of about 1 percent should be considered the maximum for an operation such as drilling. Higher sulfur contents might contribute to deposit troubles and a varnish condition.

CLEANLINESS—Cleanliness of the fuel is essential to reliable and economical operation. It is important to know the amount of water and the size and quantity of solid dirt particles. These factors determine the type of filtering equipment required. There have been cases of crude fuels containing a very fine abrasive silt creating havoc with injection equipment in spite of the thorough centrifuging and filtering job given the fuel. A good filtering job through fuller's earth will usually clean the fuel of this type of contamination and provide a satisfactory fuel.

It should be mentioned here that at any time a fuller's earth filter is used for the filtration of a fuel, it should be followed by a good cellulose filter as insurance against the possibility of earth migration. It also provides an additional stage of filtration.

STABILITY—Any fuel, regardless of type, should be stable. Most crudes are fairly stable as are most straight run distillates. Cracked, and blends of cracked and distillate fuels sometimes prove rather unstable and may create injection equipment troubles. Resulting sticking pumps or nozzles may also contribute to poor combustion. These conditions can often be corrected by the use of suitable additives.

Preparation of fuel. In the preparation of any fuel for use in an engine little other need be said than that it must be clean. How much cleaning is required depends upon the fuel. Normally, the regular diesel fuels, such as 1D and 2D require nothing more than the filtration provided by the engine fuel filters.

FILTERING—If there are several engines in an installation, the additional protection of *a larger filter in the fuel transfer line is a wise investment.*

CENTRIFUGING—The preparation of a crude that is suitable for diesel fuel presents somewhat more of a problem. The fuel must first be centrifuged to remove any water, and as much dirt as possible. The centrifuging should be followed by filtering through a very fine filter. Usually to obtain the best job of filtration it is advisable to do it in two stages, the first being fuller's earth, followed by a fine cellulose type of filter. From this point the fuel would be delivered to the engine the same as regular diesel fuel.

HEATING—Sometimes crudes, which seem desirable to use as diesel fuel, are viscous and may require heating for proper handling by the engine. Such cases are rare and generally so special that individual treatment must be accorded each case, so no attempt is being made to cover these situations.

2. Maintenance of Fuel Injection Equipment

Proper maintenance of the fuel injection equipment will insure continued satisfactory operation. Neglect of this equipment will result in power loss, rough operation, fuel dilution, lubricating oil contamination and excessive formation of deposits, which may result in stuck rings and valves, and high wear rates.

Check nozzles periodically—Proper maintenance of this equipment is a relatively simple matter, and assuming clean fuel, should consist principally of a periodic check of the nozzles. They should be clean, open at the recommended pressure, and provide the proper atomization and spray pattern.

Watch for these signs—Injection difficulties make themselves evident in various ways; such as smokey exhaust, upset balance of cylinder exhaust temperatures, dilution of lubricating oils, and misfiring of a cylinder or cylinders. When any of the above symptoms show up, check nozzle condition as a probable source of trouble. Any sudden change from normal operation calls for a check of the injection equipment.

For fuel dilution check for broken fuel lines, stuck nozzles or fuel pump valves. For smokey exhaust and poor balance of exhaust temperatures, check for proper nozzle adjustment and condition, correct opening pressure, and proper atomization and spray pattern.

There are, of course, other things that can happen to upset the combustion process and engine operation, but they are more or less rare and beyond the scope of this discussion.

3. Drilling Engine Lubrication

Proper lubrication of diesel engines in drilling service calls for heavy duty oils equivalent to MIL-0-2104 specification, for good engine life, low wear rates, and lower maintenance costs.

Where loading in severe or the fuel is a little on the poor side, supplemental oils will more than pay for themselves in improved operation. In fact, supplemental oils will provide improved performance in any drilling operation.

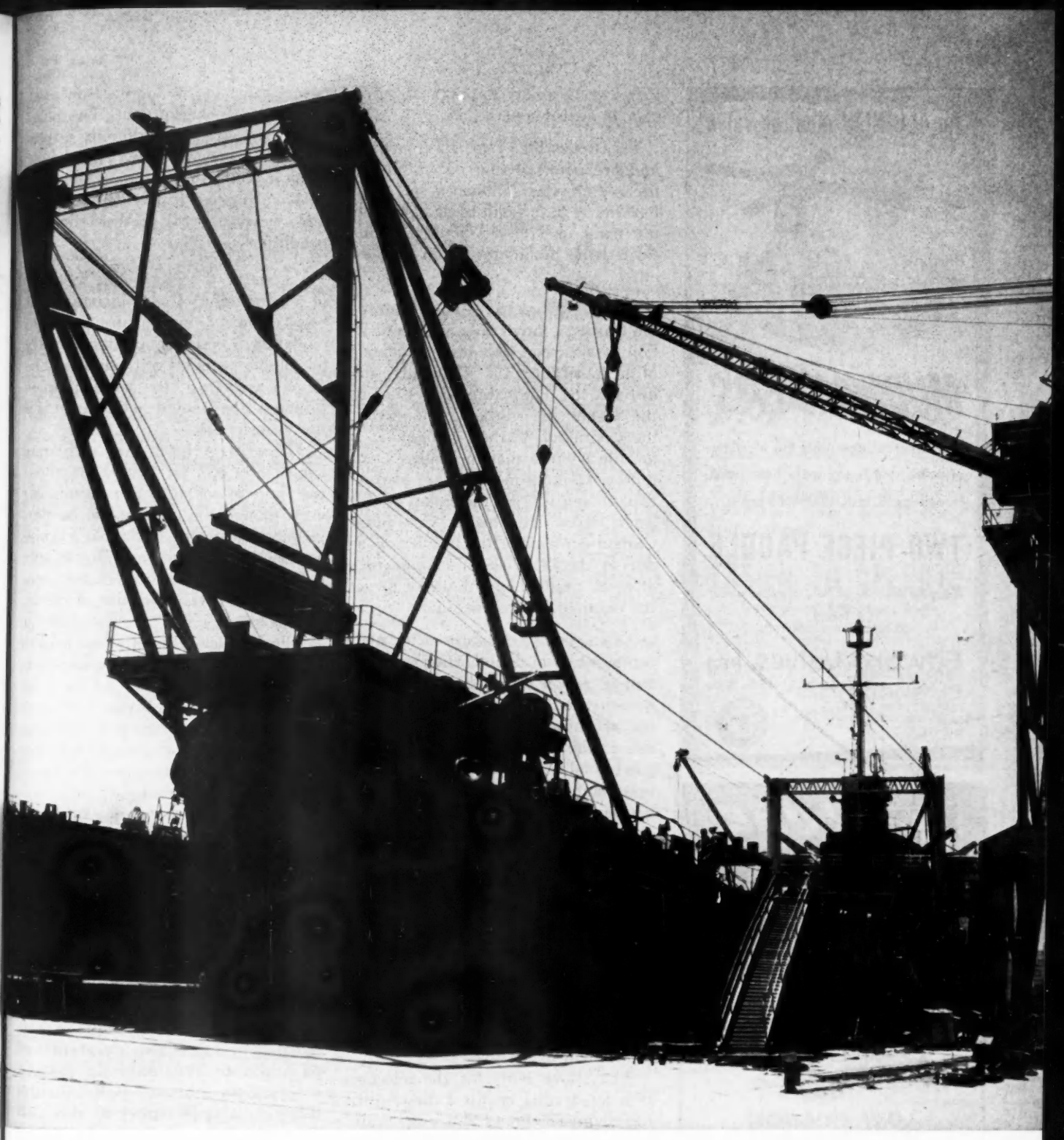
Factors to consider when selecting oils—In the selection of oils the following hints are offered:

API GRAVITY—This should be fairly high; that is, of the order of 26° to 30° as an indication of the type of base stock from which the oil was made. Paraffin base or mixed base oils generally provide the more stable higher grade lubricating oil. Oils of this type also provide better film strength.

VISCOSITY—Oils having a good body or viscosity are necessary for proper lubrication. SAE-40° oils; that is, oils with a Saybolt Universal viscosity from 70 to 85 seconds at 210° F. fulfill this requirement. The reason for this is that we are interested in a viscosity at operating temperatures of from 180 to 260 SSU. Oils lighter than the above generally cannot maintain the proper operating viscosity at recommended operating temperatures. Operating viscosity is the important thing, and oils should be selected on the basis of providing this viscosity under normal operating conditions.

VISCOSITY INDEX—Viscosity index gives an indication how much an oil changes its viscosity with temperature. (The higher the VI, the less viscosity change there is with temperature.)

POUR POINT—The pour point of an oil is important because it indicates its fluidity at low temperatures and



Wire Rope at Work—It's easier now to probe for oil beneath the ocean floor. When the offshore platform is serviced by a tender like this one, equipped with a wire rope cableway, the handling of equipment and supplies becomes a quick, simple matter. The system shown here has done away with many problems that formerly slowed up the transfer of loads from tender to drilling platform.

Bethlehem wire rope and strand are used throughout this overhead cableway, a rigging designed for 10-ton loads. The skyline consists of 237 ft of 2½-in. strand. The load, travel, and return lines are wire rope and are 410 ft, 275 ft, and 463 ft in length respectively. This is one of the newest oil-country uses for Bethlehem rope and strand, which are available for every type of service in the petroleum industry.

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therefore its ability to flow and lubricate at these temperatures.

FLASH AND FIRE POINTS—The flash and fire points should be considered because of their influence on these hazards. A flash point of 425° F. and fire point of 475° F. should be considered the minimum for an SAE-40 oil.

CARBON CONTENT—The Conradson Carbon content gives some indication of a carbon depositing tendency of a lubricating oil. Generally, the heavier the lubricating oil; that is, the higher the viscosity, the higher the Conradson Carbon content. It is not always true that the higher Conradson Carbon means more carbon deposit, but it is an indication of this possibility. The higher Conradson Carbon contents of the heavier oils is due to the blending in manufacture of more residual bright stocks to get the required higher viscosities.

ASH—Ash is a measure of the non-combustibles in the oil. High ash content of an oil simply means that the deposits from this source can accumulate to cause trouble and wear. The ash of the base stock in the case of good quality oils as a rule is fairly low, increasing somewhat as the oils get heavier. Additives used in heavy-duty oils contribute as a rule considerably more ash than is contained in the original base oil. Ash from this source, as a general rule, causes no trouble.

SULFUR—Most lubricating oils contain sulfur to some extent. High sulfur concentrations might tend to form corrosive acids and varnish. It is wise to select oils containing as low a sulfur content as possible.

The above hints for the selection of a lubricating oil for a diesel drilling engine are broad and general and are intended only as a guide. They point out those characteristics of a lubricating oil that if disregarded can be the cause of trouble.

Modern heavy duty lubricating oils marketed by reputable oil companies recognize these points, and do a very satisfactory job in providing lubricants incorporating these considerations.

When to change lubricating oils—The determination of the condition of used oil is as important as the selection of new oil.

When to change oil is a question that is often asked and one that is never satisfactorily answered. And justifiably so, because of the many factors involved in different operations. The general answer is change when it needs it.

When it needs it may depend upon any one or several of the following conditions:

VISCOSITY CHANGE—The viscosity of a lubricating oil will increase as it breaks down, which in turn is due to oxidation. Oxidation produces heavy oil soluble products of oxidation. The more oxidation, the more of these products are created and the greater the viscosity rise.

The writer believes that a viscosity rise of 300 SSU at 100° F. is about the limit of viscosity rise permissible even though the oil seems to be performing satisfactorily. Serious varnish and lacquer deposits are almost sure to follow continued use of oils containing excessive quantities of oxidation products.

Dilution of a lubricating oil is indicated by a drop in viscosity and is likewise a serious condition. A drop of 300 SSU in the viscosity at 100° F. is approaching the danger point. Formation of lacquer and varnish and loss of film strength decreases the lubricating ability of an oil.

Different oils, however, have the ability to absorb different percentages of fuel dilution before registering the allowable drop in viscosity. Therefore no figure of a percentage of dilution can be given as a satisfactory point for all conditions.

Often a dilution of 5 percent is considered the maximum limit for safe operation. However, 5 percent dilution means that a sample of new oil must be taken and 5 percent fuel oil added to it to ascertain the viscosity of the lubricating oil with this dilution. It is far easier to take 300 seconds as the limit, regardless of what percentage of fuel it takes to reach that point. Viscosity checks can be easily and quickly made with various instruments made for this purpose.

ACID OR NEUTRALIZATION NUMBER—With modern heavy-duty oils, the accepted method today of checking the acid number of a used lubricating oil is by ASTM method D974-52T. This method has largely superseded the old ASTM D663. The results from D974 give readings considerably higher than the older method and total acid

results of up to 3 or 3½ are often recorded in oils in service. Oils showing a total acid approaching 3 or slightly above, should be carefully watched and an oil change considered. Under the old D-663 method 1.25 to 1.5 was considered a high neutralization number and indicated an oil change was needed.

It should be pointed out, however, that the above figures are not hard and fast. Some oils, due to the additives in them, might become unserviceable at lower or higher readings. The only safe way is to check with the oil company supplying the particular oil in question to ascertain the limits of each particular oil in this respect.

PRECIPITATION—Precipitation is a measure of the naphtha insoluble products in an oil, and reveals to some extent the oxidation that has taken place. A precipitation number of .1 is generally assumed to be the maximum. Higher precipitation numbers are sometimes reached without apparent harm when large volumes of oil are contained in the system.

There are on the market kits for making regular checks of both neutralization number and precipitation number. These kits do not give accurate neutralization or precipitation figures, but indicate trends and safe limits. Also these kits have facilities for checking relative viscosity, water, and sediment in the oil.

It is much more important to know the trends of these factors than the actual figures. For example, a sudden change in viscosity may mean the oil is oxidizing at a rapid rate, perhaps due to some operating fault. If the viscosity drops it can mean that nozzles are faulty, or a bad leak or broken line is dumping raw fuel into the lubricating oil. Often fuel dilution can become serious suddenly simply from a nozzle that is stuck or leaking badly. Light loads and excessive idling often result in excessive dilution.

A sudden change in neutralization or precipitation number or both is of more importance to the operation than is the actual number. Such a change indicates that the oil is deteriorating rapidly and should be changed, or it may indicate some correction in operating procedure is needed. To say just when an oil change is needed is much easier in the light of records of the checks outlined above. Without these checks any changes would have to be made on the basis of human judgment or the arbitrary establishment of regular drain periods. Either of these could be wasteful from the standpoint of discarding oil too soon or disastrous from the standpoint of using it too long.

4. Lubricating Oil Maintenance (Filtration)

Proper maintenance of the lubricating oil will pay handsome dividends in both freedom from operating trouble and lower engine maintenance and lubricating oil costs. By proper maintenance is meant, regular checks as to its condition, adequate filtration of the lubricating oil, and filtration of the combustion air.

Adequate filtration can best be accomplished with a good full flow filter, several of which are available on the market. Shunt, bypass, or bleeder filtration fall short of doing the best job of engine protection possible. No matter how fine a filter is used, if it doesn't filter all of the oil, dirt is circulated which may cause damage to engine bearings and parts. While actual dirt removal of the full flow filter may average only 20 or 25 percent more than the other types of filtration, the particle size of the dirt that remains is almost colloidal in size and not harmful to engine parts.

Just because an oil is visually clean does not mean that it is free of harmful dirt. For example, the oil in the sump or crankcase of an engine can appear to the eye to be clean, yet it will still appear the same if two or three handfuls of sand were thrown into it. Against such treatment the engine would receive no protection except from a full flow filter.

Combustion air filtration—Of equal and probably greater importance is the filtration of the engine combustion air. The best, most efficient filter that money can buy is none too good in the light of the amount of dirt that an engine must breathe. To illustrate, by example, what an engine breathes in the form of actual dirt, the following figures should be of interest.

Assume a 9 x 10½-inch, four-cycle, eight-cylinder naturally aspirated engine running at 720 revolutions per minute, a dirt fall[1] of an average of

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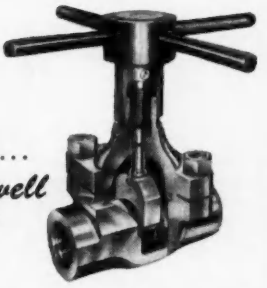

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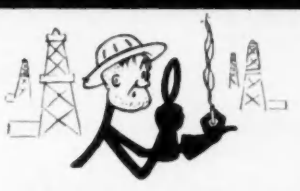

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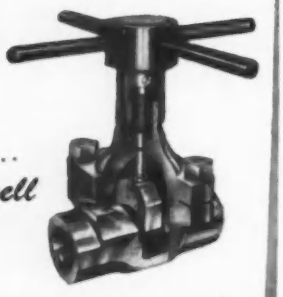

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12 tons per square mile per month, and the engine equipped with an oil bath filter of 97½ percent efficiency.

In one year the engine in question in continuous operation, will consume at atmospheric pressure approximately 575,424,000 cubic feet of combustion air. The average of 12 tons dirt fall per square mile is an assumed average based on actual measured dirt fall in an open or suburban area, such as might be encountered in a drilling operation. It must be assumed that there is little dirt above one mile, and for purposes of this example it is assumed that the dirt fall is that which is deposited from one cubic mile of atmosphere. Of the air depositing this dirt, the engine breathes about .4 percent which means that the engine breathes .4 percent of the 144 tons of dirt falling in one year, or about 1150 pounds. Assuming then that the air filter on the engine is 97½ percent efficient, the engine will actually breathe in one year about 29 pounds of dirt in spite of the best filtration available. In densely populated and industrial areas this figure could well be 150 pounds per year. Without an air filter the engine would be breathing under the best conditions about 1000 pounds of dirt per year, and under conditions in some locations perhaps as much as 6000 pounds of dirt per year.

Fortunately, the greater part of this dirt goes on through the engine and out the exhaust, but some of it remains to create engine wear and contaminate the lubricating oil. It is generally agreed that the oil bath type of filter is most efficient, from 95 to 98 percent, and should be used.

5. General Engine Inspection and Housekeeping

General engine inspection and housekeeping is a subject that often is overlooked in an article such as this, but a few words on this subject will not be out of place. Proper attention to this phase of operation many times reveals corrections or adjustments that should be made, and that if neglected will create major maintenance problems.

Keeping an engine clean makes it easy to work on and at the same time reveals the location of oil leaks and worn parts. Regular inspections and wiping down of an engine pays dividends in low maintenance cost and improved operation.

SUMMARY

Summarizing those points that are important if an engine is to give good service and operate with minimum maintenance, regular attention must be given to:

- The selection of a good fuel that is reasonably stable, has the proper viscosity, has good combustion characteristics, and is relatively low in sulfur.
- Proper preparation of the fuel for the engine; that is, through dirt and water removal by means of adequate filtration and if necessary centrifuging.
- Regular inspection and maintenance of the fuel injection system.
- The selection of the proper grade and type of lubricating oil. The use of heavy-duty oils is indicated and certainly will prove to be the more economical in the long run.
- Regular inspection and checks of the lubricating oil condition, paying particular attention to viscosity, acid or neutralization number, and precipitation number. Immediate attention is required any time a rapid or sudden change from the normal trend takes place.
- Adequate and thorough filtration of the lubricating oil must be maintained if good oil life and freedom from destructive contamination is to be expected. Full flow filtration is the only method of filtration that gives assurance that the engine will be lubricated with oil that is free of harmful and wear producing dirt.
- Adequate filtration of the combustion air to eliminate as far as possible dirt entering the engine from this source. Good oil bath air filters provide the best means of accomplishing this.
- Regular inspection of the engine and keeping it wiped down clean. (Good housekeeping.)

While the hints and suggestions are made with the drilling rig diesel in mind, they are applicable to any installation. The drilling industry, however, due to the nature of its operation, must have a continuous dependable source of power and these suggestions, if followed, should provide the pattern for a program that will assure maximum results from diesel engines.

REFERENCE

[1] "Variables in Monthly Dust Fall Measurements," by J. Deane Sensenbaugh and W. C. L. Hemeon. Presented at the 56th annual meeting of ASTM, Atlantic City, N. J., June 28-July 3, 1953.

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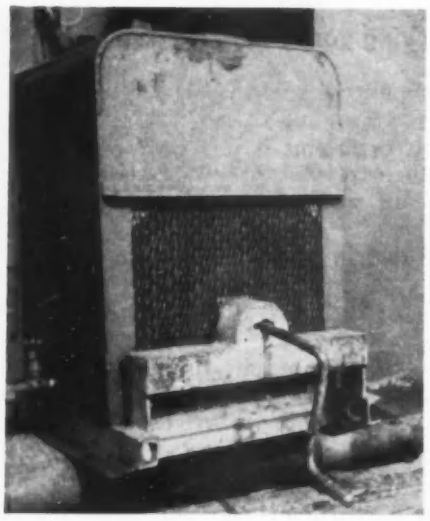
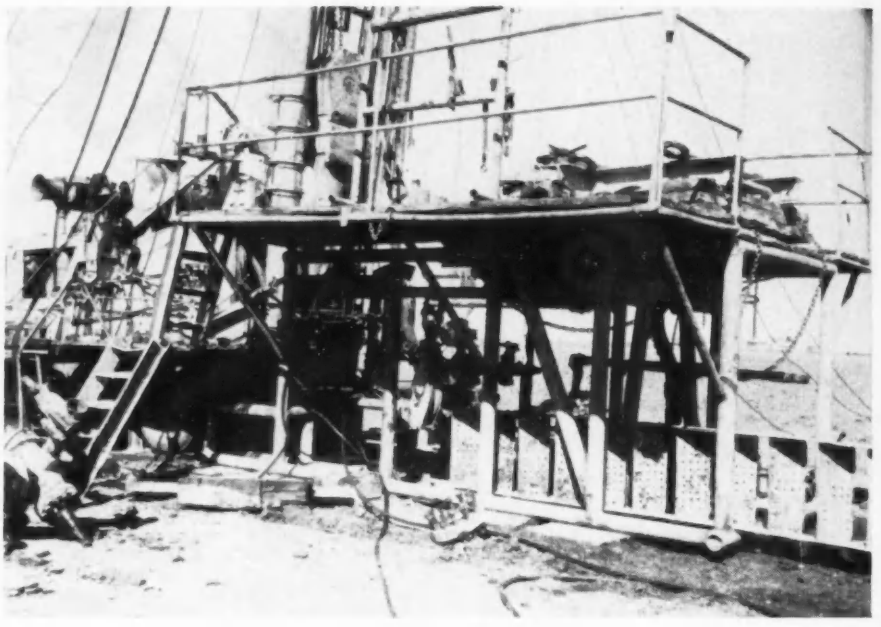


Protected Light Unit Slides Out of Doghouse

In order to have the light plant handy and well protected, one contractor mounts the plant on a skid with weather paneling on front and slides it out of the doghouse for operation. This provides ventilation in the summer, makes it easy to service the unit and conserves space for other operations inside the doghouse.

The unit is mounted on skids with heavy bracing around the crank and lower part of the radiator end, the part most easily damaged. The skids are made from channel iron with eyes in the end for hooking the winch line. The guard and receptacle for the crank are made from heavy rig iron to protect the radiator. The engine is provided with an "anti-kick" dog so that a crank can be used safely for starting.

The unit is carried in the doghouse when the rig is moving over the road or stacked and it is a simple matter to attach the winch line and drag it out during rigging up operations. It is skidded out just far enough so that the gas line can be hooked up using a quick acting union on the end of a rubber hose.



Substructure Serves as Hauling Rack

A workover rig substructure can serve as a rack for various tools so that moves between wells can be made in two loads. This can be made from used drill pipe and pipe scraps.

The body of the substructure is made of 4-inch drill pipe and is sufficiently strong to accommodate the stands of pipe in the derrick. Hand rails are made from 2-inch line pipe braced with 1-inch pipe.

At rig-down time, all the rig material is placed on the rig floor and chained securely. Long pieces are thrust into the framework of the substructure where they are readily accessible when the structure is spotted over the new christmas tree.

Chain Tong Rack Is Convenient on Rig Floor

A Gulf Coast contractor has devised a rack to keep chain tongs in a convenient and conspicuous yet out-of-the-way place.

Rack is made from 3-inch scrap pipe. First a rectangular base is made by welding together two 2-foot lengths and two 6-foot lengths. Two 2-foot long uprights and two 6-foot long uprights are welded in place at each corner. These two crossbars are secured to uprights.

At each end, two pieces of pipe are welded at a 45-degree angle, connect-

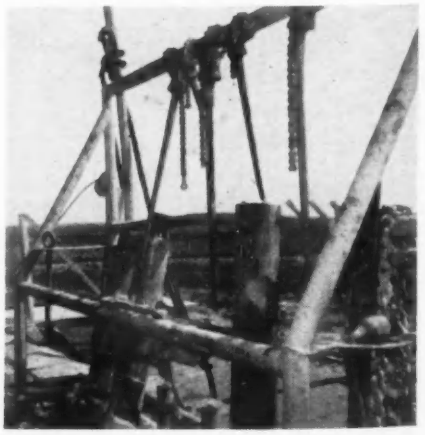
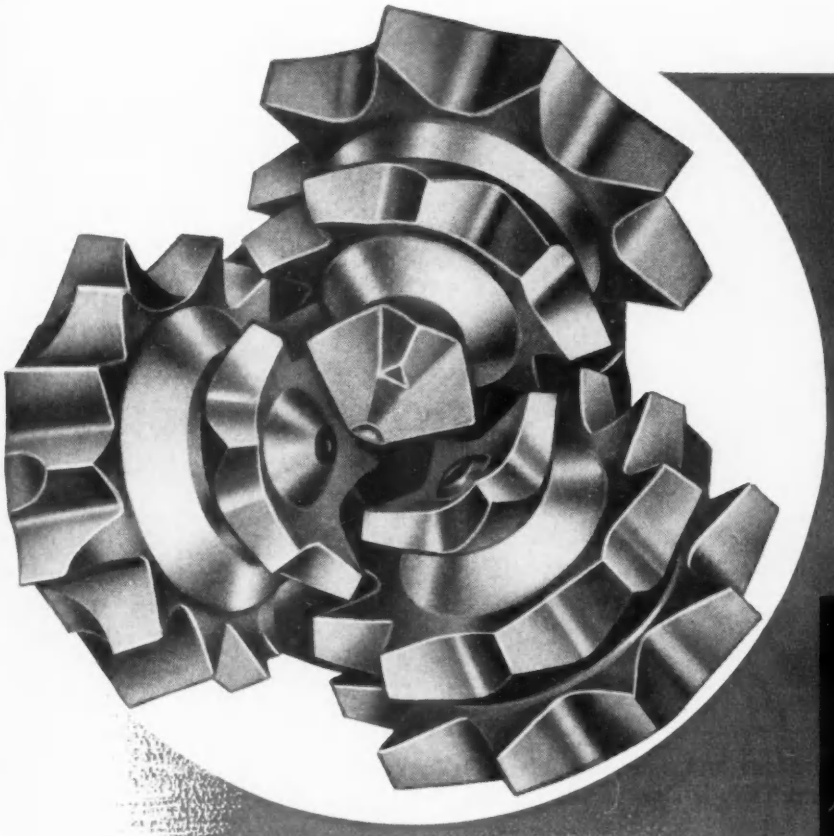


FIGURE 1



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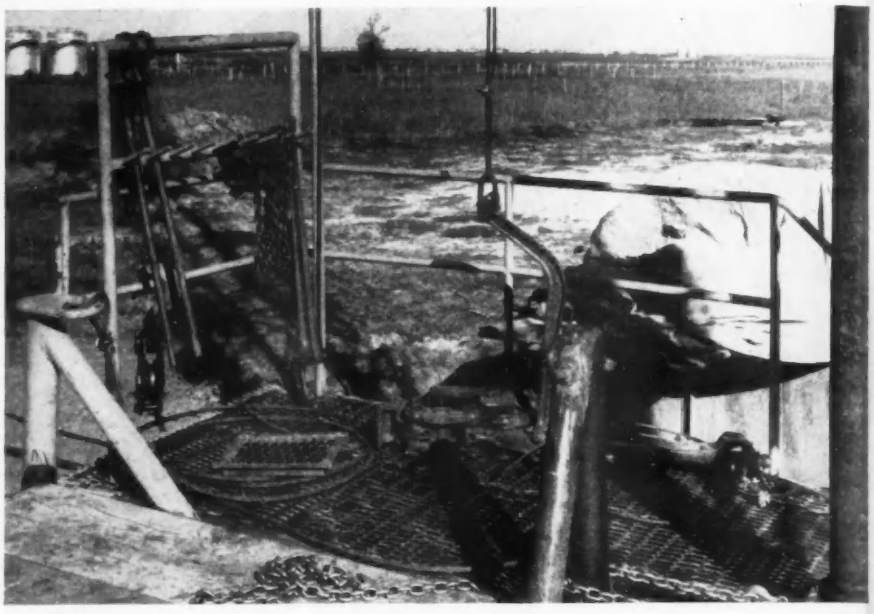
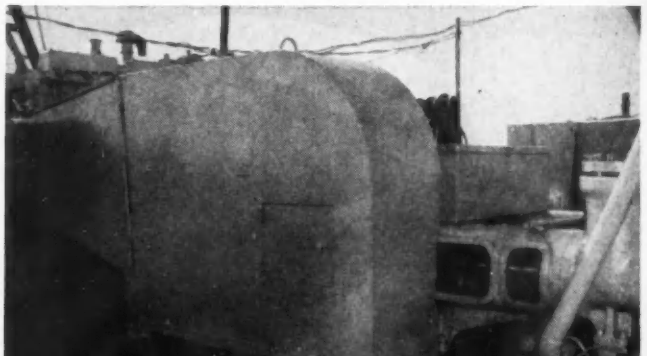


FIGURE 2

ing the long and short uprights. This rack normally is kept on the rig floor (Figure 1). Figure 2 shows an optional design.

Portable Hinged Guard Protects V-Belts



A portable hinged guard was developed by Pam-Kar Drilling Company of Wichita, Kansas, to protect both the workmen from the V-belts and the V-belts from the weather and dust. The covering is made from tank steel with a loop in the top so that it can be spotted with the derrick line.

By making the cover integral with the foundation of the pump, it can be moved when the pump is moved. A hinged side swings back to facilitate the removal and installation of the V-belts. The piano hinge is made from nipples of three-eighth-inch pipe with a bar snugly inserted to form the hinge. If this plate must be removed, the bar can be removed and the side taken off.

A small trap door is cut in the side panel for easy inspection of the belts and checking the bearings on the pump. It is made by cutting a square hole in the side panel of the cover

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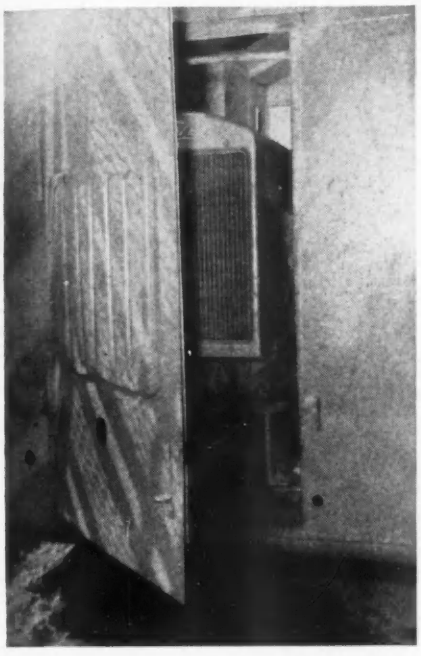
and attaching gate hinges and a small homemade latch.

The box on top of the pump bed contains lubricating oil. The oil flows over the piston rods just outside the packing, then flows to a sump where it is pumped back up to the containing vessel.



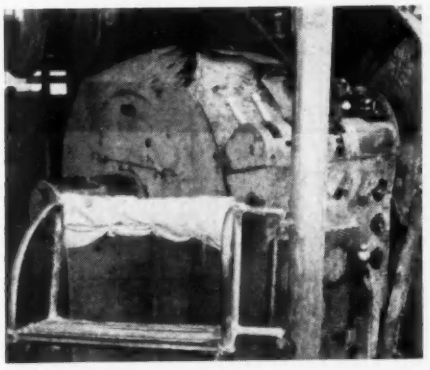
Cowl on Door Provides Ventilation and Protection

Where the auxiliary unit must run in all kinds of weather, one contractor makes another opening in the door of the auxiliary house to allow ventilation. In order to keep the rig orderly he takes the cowl from a worn-out engine and fastens it over the hole in the door. This allows the engine to be run during rainy weather with plenty of ventilation, but no rainwater will come in and cause damage to the engine.

In winter, the door is kept closed at all times and a piece of canvas can be hung over the radiator grill on the outside to provide the proper cooling for the engine and the proper temperature inside the auxiliary room.

Swinging Driller's Seat Is Made of Scrap Pipe

Make an easy-to-remove driller's seat of scrap half-inch pipe by devising two spigots to drop into nuts welded on the spinning post. The seat is shaped (see photograph) with small pipe or rods welded to form the bottom. In an emergency the seat swings out of the way.



Rig Lamp Posts Provide Better Lighting on Rig

Rig lamp posts are helping to provide better lighting and safer drilling practices on a West Texas drilling contractor's rig. Fabricated from scrap drill or line pipe and steel sheet iron, these posts can be conveniently placed to eliminate the dark corners of the rig.

A metal hood is made to keep rain and mud off the bulbs. The hood measures about three feet square at the base and is soldered to angle iron

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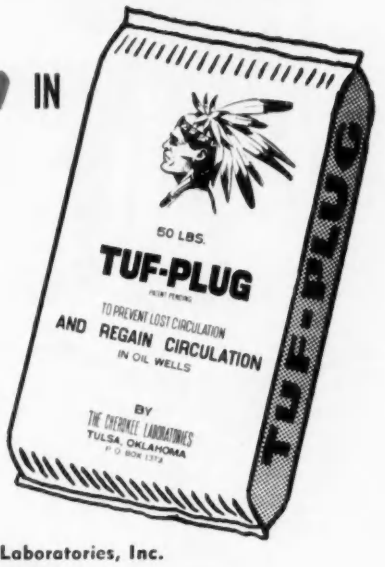

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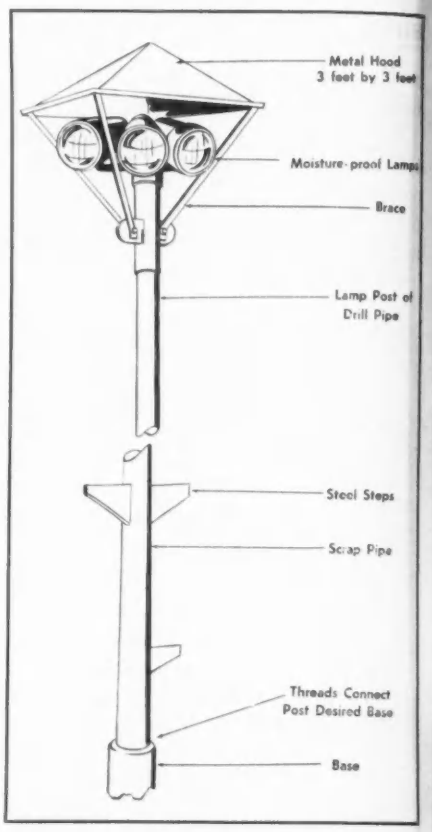
reinforcements. Steel braces from each corner bolt to the gussets on the post shown. Scrap steel, shaped as shown, form steps for replacing light bulbs.

The lamp posts are made of scrap 3½-4 inch drill pipe or line pipe which can be bolted, thread connected or welded to any base support. They can be placed at the end of the catwalk, on a mud pump skid, on a mud tank, or on the remote badly lighted corners of the derrick floor.

Moisture and explosion proof lamps are used. They are welded to braces which in turn are welded to a coupling accommodating four to six lamps radially around its perifery.

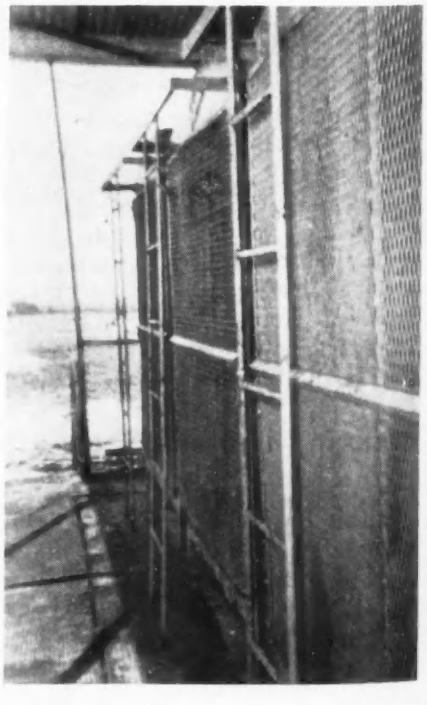
The coupling has a threaded connection for connecting lamp post and has holes for the insulated wire cable to pass through. A small 1-inch to 1½-inch galvanized pipe carries the cables to the bottom of the post where electric plugs permit connections without the necessity of overhead wires.



Steel Ladder Facilitates Engine Radiator Inspection

A sturdy steel ladder welded to the front of the radiator of large drilling engines will aid inspection. This ladder provides easy access for inspection of the water level.

Ladder is made of three-quarter-inch pipe. One end is welded to a U-bracket, which in turn is welded to the radiator.



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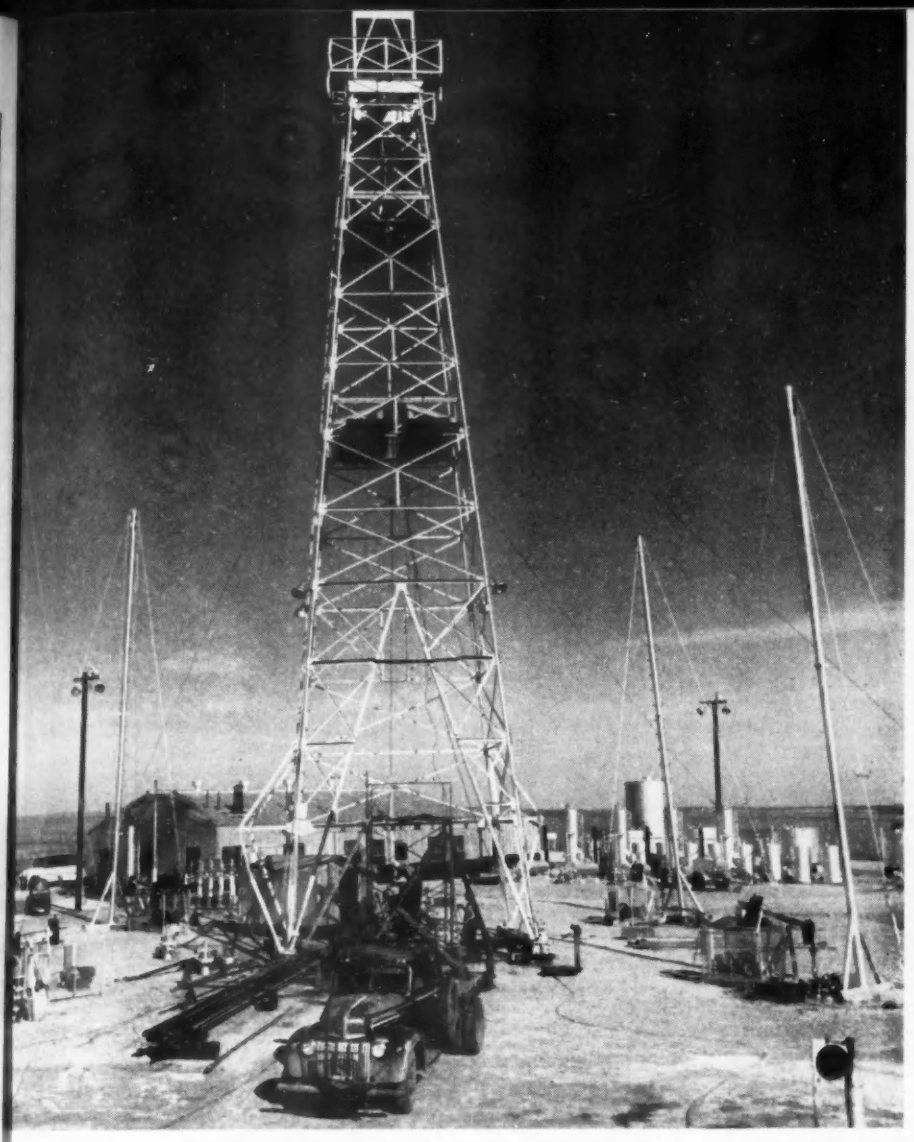

1 Surface installation of Magnolia's in-situ combustion experiments being conducted in Southern Oklahoma south of the Loco field. Derrick is located over the injection well in a five-spot pattern. Gin poles are leaning over four surrounding producing wells. Injection well is being rigged for running the igniter.

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Research Facilities on In-Situ Combustion of Oil

Setting fire to an underground oil reservoir to aid in recovery of thick, heavy crudes is one of the industry's most interesting research projects.

Two important oil recovery experiments came to the forefront last year. Field tests by Sinclair Refining Company and Magnolia Petroleum Company on thermal recovery of viscous crude were encouraging (WORLD OIL, November, 1953, page 184). Theoretical considerations of this process are quite involved, and have been the subject of several technical papers. Out of this extensive research may come a practical solution to the recovery of some 4 billion barrels of heretofore unrecoverable thick oil in the U. S. alone. In the pages that follow, the editors of WORLD OIL take the reader on a quick tour through one of these field experiment projects—Magnolia Petroleum Company's "in-situ" combustion field test in southern Oklahoma. This test is the continuation of some five years of research.

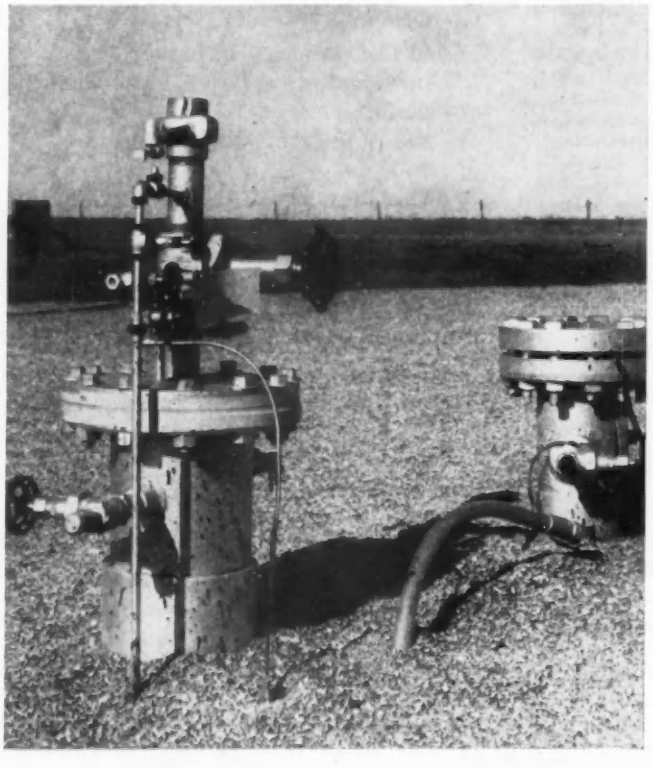
HIDDEN AWAY in the rolling hills of Southern Oklahoma and not too far southwest of the old Loco field in Stephens County, is Magnolia Petroleum Company's field research project on the thermal recovery of crude oil. Here, engineers are quietly going about their business of learning if an underground fire can aid in the recovery of thick, heavy oils which up to now have not been produced economically. Called "In-Situ" Combustion by Carl S. Kuhn and Robert L. Koch, who head the research project, this is a joint venture of the Flying Red Horse Companies—Socony-Vacuum Oil Company, Inc., and Magnolia Petroleum Company and General Petroleum Corporation.

The project is in its third phase of investigation, that of determining field performance of a "five-spot" pattern, shown in Figure 1.

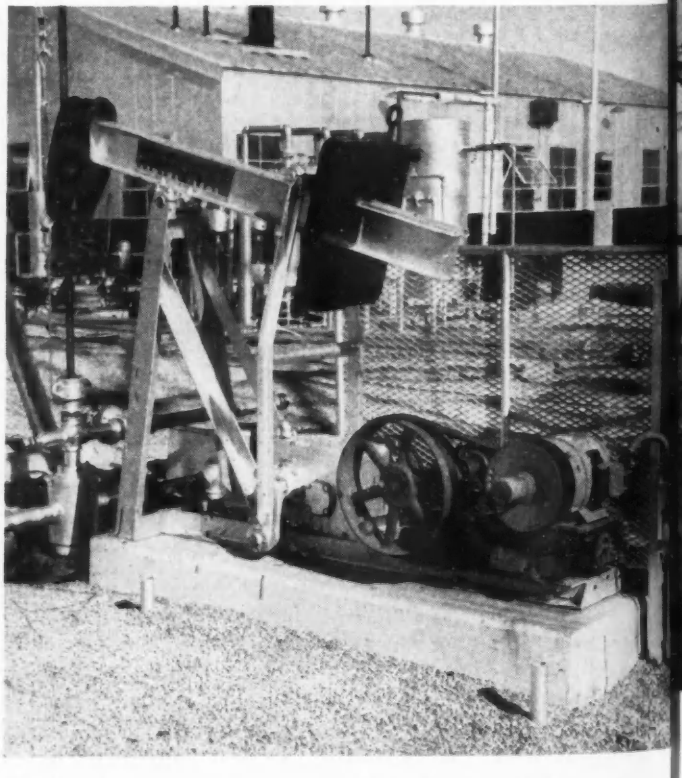
The first phase included nearly five years of extensive laboratory investigation. The second phase was to determine if combustion could be supported underground, and to develop a suitable means for igniting the reservoir. To carry out the second and third phases of this investigation, a 30-acre sand lens located just south of the Stephens-Jefferson counties line was selected. Five acres covering the crest of this lens provided the testing grounds. The sand is about 180 feet deep and varies in thickness from about 15 to 20 feet. Gravity of the crude is 18.5° API with a viscosity at 60° F. of 7413 centipoises. A reservoir containing a viscous crude oil as selected in view of the conventional secondary recovery methods being of little effectiveness in such cases. More-

2 Stainless steel electrical igniter shown in foreground with lubricator immediately beyond. Lubricator is necessary in order that air may be injected continuously during ignition period. Operations building housing recording and testing equipment at right of derrick.

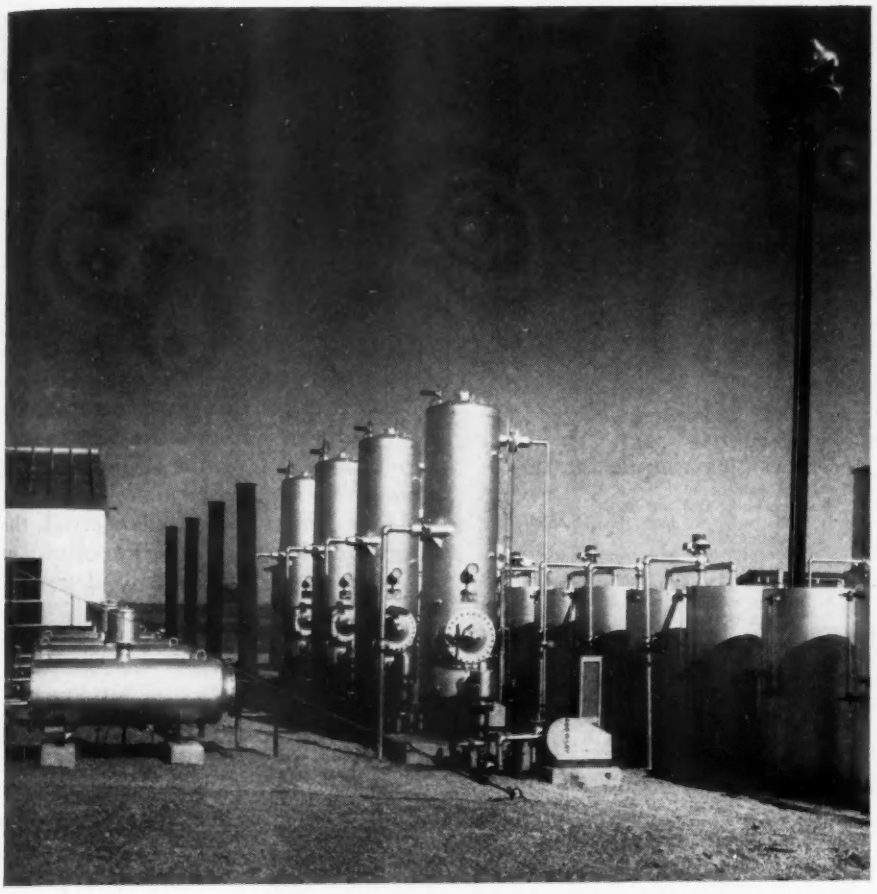
3 Wellhead of a producing well showing connections for collecting gas samples and recording casing pressure during operation. A thermocouple is used to record continuously bottom-hole temperatures during test. Casinghead gas is analyzed constantly for products of combustion.



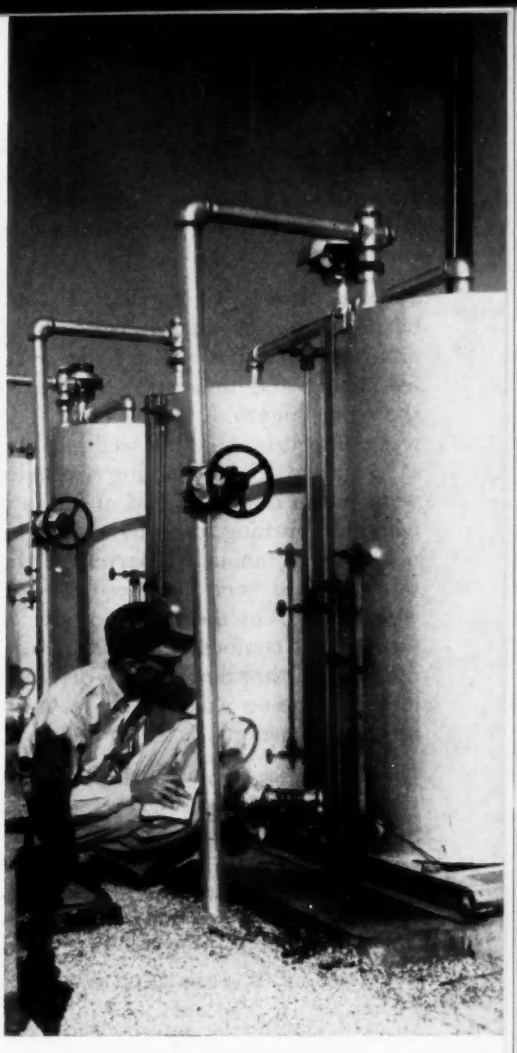
4 Observation wells located at various points inside the five-spot pattern. Progress of the burning front may be checked by analyzing produced gases and recording bottom-hole temperatures in these check wells.



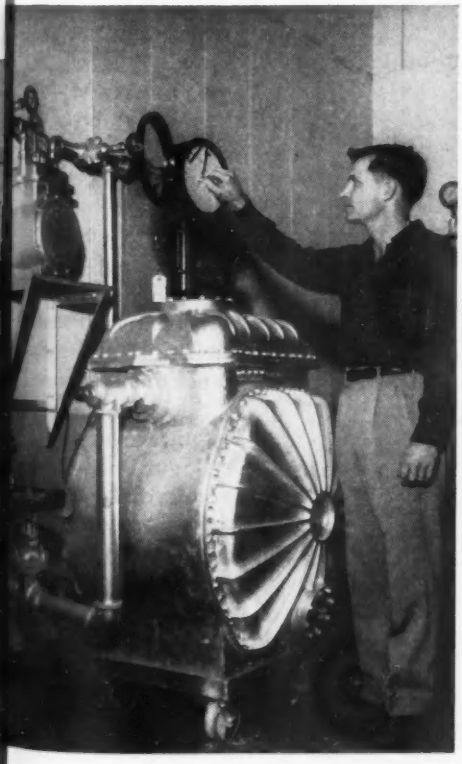
5 Pumping equipment on one of the four producing wells. Electrical controls simplify regulating the producing cycle of each well. Rate of production may be controlled by changing adjustable sheave on driving motor.



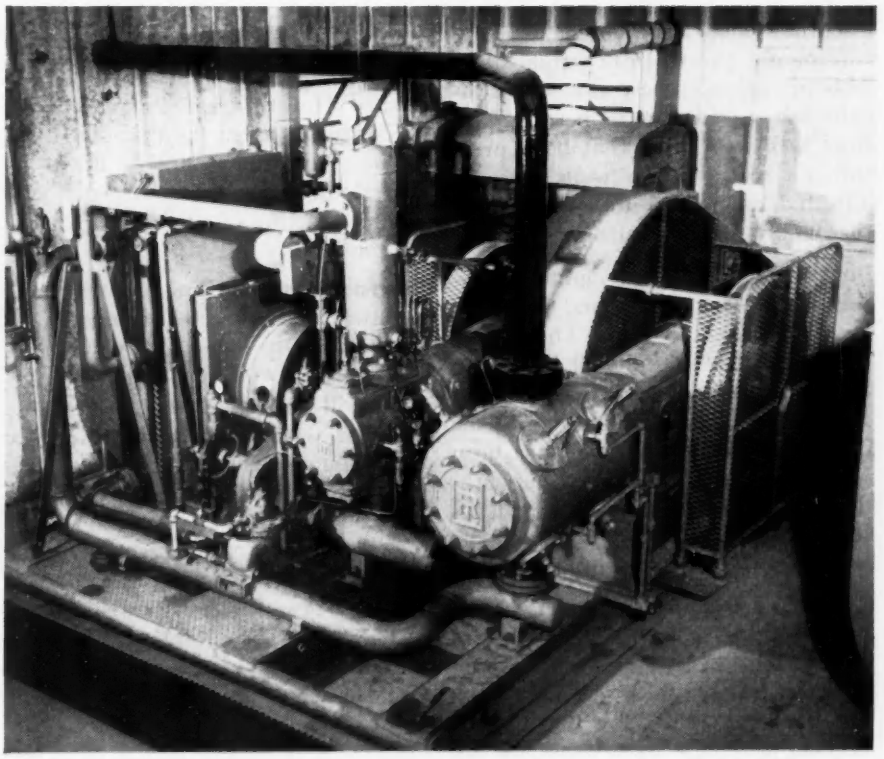
6 Tank battery equipment for in-situ combustion experiment. Heaters at left reduce viscosity so oil will flow freely into separators in center. Each well has its own heater and separator. Gauge tanks are at right.



7 Here an operator carefully records the oil and water level in these 6½-barrel calibrated tanks.



8 Large low-pressure meters measure volume of gas produced when rate is high; small meter set on wall measures rate when it is low. Here operator changes recording chart. Heavy meters are on casters, can be moved easily.



9 Two-stage compressor used to compress air injected into injection well. It is rated at 64.2 horsepower at 325 revolutions per minute. Two such compressors are available; one serves as a standby.

CONTINUED

over, if "In-Situ" combustion offered a practical means of recovering the most difficult oil, then it could probably be used under more favorable conditions.

Second phase. To find out if combustion could be supported underground, three test wells located 20 feet apart and in a straight line as shown in Figure 1, were drilled. Air was pumped into an end well and the sand ignited. The remaining two wells were pumped. At the end of 55 days when the burning front arrived at the nearest well, about 81 barrels of the thick oil had been produced. It was concluded from the second phase of testing that combustion could be supported, and that the specially-designed electrical igniter was suitable for initiating combustion.

Third phase. The third phase involved drilling five wells as indicated in Figure 1. The center well is 40 feet from each of the outside four wells which form a square around it (sometimes called an inverted 5-spot pattern). The four producing wells are equipped with standard pumping equipment. Without auxiliary aid, these wells will pump less than one barrel of oil per day. Air has been injected into the center well to establish gas permeability between the injection and producing wells. This is essential, since air must be injected continually to support combustion. This air injection test also will indicate any variation in permeability from well to well so that back pressure on some of the wells may be adjusted as needed to encourage a reasonably uniform burning front.

Igniter. The electrical igniter measures about 45 feet long and is housed in a stainless steel tube. The igniter is run in the injection well through a special lubricator which makes it possible to inject air continually into the center well. After the well has been ignited, the igniter may be withdrawn. Throughout the experiment, it is necessary to inject air to support combustion in the formation.

Heat of combustion is quite high, and the heat travelling ahead of the burning front increases the temperature of the thick crude so that the pressure created by the injected air will cause the oil to move toward the producing wells. During the combustion process, some cracking takes place, releasing some lighter ends and

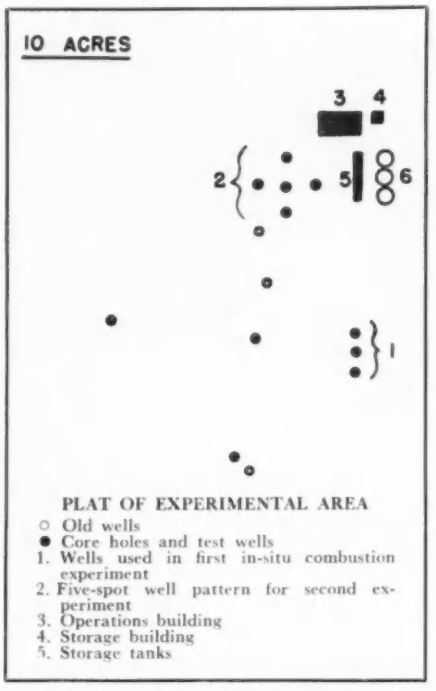


Fig. 1—Schematic layout of principal segments of in-situ combustion tests now under way on ten-acre site in southern Oklahoma.

leaving behind a region of sand which contains a hydrocarbon residue similar to petroleum coke. This coke is burned, and subsequent cores taken by air drilling methods show the sand to be perfectly free of hydrocarbon and to have the appearance of a clean beach sand.

How much oil is burned and how much is produced? This is a question on which more data are to be obtained. However, based on analyses of produced gases in the three-well test, it was indicated that only about 9.5 barrels of crude were burned during the production of 81 barrels of crude in the 55-day test.

Surface installation. Air is supplied by two-stage air compressors capable of putting up about 200 pounds per square inch. However, injection pressure will not exceed that of the overburden, which at this depth is about 180 pounds per square inch. There are two such compressors, one serving as a standby.

The amount of air injected into the center well is carefully measured in positive-displacement type meters. Amount of gas produced from each producing well also is carefully measured. Each producing well is equipped with thermocouple units for automatically recording bottom-hole temperatures. Samples of produced gases are analyzed periodically. Gas produced goes through a separator where liquids are removed. Produced liquids also pass through an indirect heater then into a separator. Produced water and oil flow over into 6½-barrel gauge tanks where water and oil volumes are gauged periodically and recorded. Each producing well is equipped with a separate liquid collection system.

Observation wells. Between the injection well (at the center of the five-spot pattern) and the producing wells are situated what are known as observation wells. Sole purpose of these wells is to provide data on formation temperature and pressure, and to permit taking gas samples which may be analyzed for combustion products. These observation wells permit the researchers to follow the course of the burning front and to determine changes in temperatures as the front progresses across the observation wells.

A challenge. In the U. S. alone there are in excess of 4 billion barrels of thick, viscous crudes which up to now have not been economically recoverable. They are too thick to flow and require some outside assistance. The idea of adding heat to reduce viscosity is not new. It has been tried in many different forms. Several companies here and abroad have worked on the problem, for the U. S. is not the only country possessing vast quantities of thick oil deposits.

Even the Russians theorized in 1935 that a formation could be set on fire to provide the heat needed to reduce the oil viscosity. It was also tried in Sweden years ago.

The third phase of these experiments will provide additional vital information which will clarify the practical aspects of this method. Present data are encouraging. Should the outcome of these experiments point the way to a practical solution for producing these "unrecoverable" thick crudes, our reserve picture would certainly be changed. In Canada also lie vast known reserves of this type oil. The Athabaska oil sand deposits alone are known to contain many millions of barrels of this type of crude. It can be readily understood then, the full meaning of these important field experiments currently being conducted by Magnolia. Truly, the eyes of industry are closely watching this significant research project which may mean so much to all concerned. —**The End**

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Flood to Double Recovery In Pioneer Texas Field

- **Secondary recovery expected to equal primary recovery of Mildred Pool.**
- **Oil is thick, field is faulted, and bottom water exists.**
- **But a pilot flood was successful.**

By BERT S. GUTHRIE, Coffield & Guthrie, Inc., Corsicana, Texas

RESULTS FROM a pilot water-flood in the Mildred pool, second oldest oil reservoir in Texas, indicate that as much oil will be recovered through water-flooding as was recovered by primary methods. The pilot water-flood was installed in April, 1952, and has yielded enough information to be very encouraging. Core analysis and flood pot tests also have indicated the possibility of an economically successful water-flood.

Although the Mildred pool is generally known and carried on the Texas Railroad Commission records as part of the Corsicana shallow field, it is a separate reservoir from the Wolf City sand, which has been under flood for slightly more than four years with good results. The Wolf City sand has all characteristics of a good water-flood prospect. The relatively high viscous crude of the Mildred pool, along with other problems, has forestalled development in that area until the Wolf City flood was almost completely developed.

The Mildred pool was discovered in 1900 as a result of attempts to extend the Wolf City reservoir which was opened in 1895. Because most of the companies developing the field in its early stages have long since dissolved or changed hands, drilling, development, and production histories are sketchy. Production history is known from 1900 to 1915 and from 1933 to date, showing the field reached peak production in 1906 with 673,221 barrels. Interpolation between known portions of the production decline curve show that this pool has produced approximately 7,500,000 barrels of oil from 2500 acres.

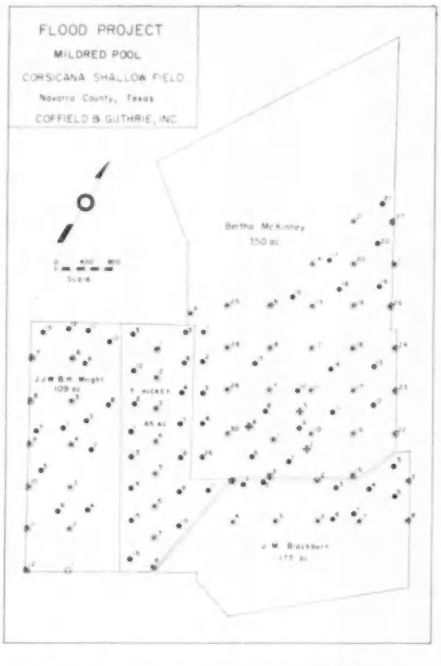

Fig. 1—Four leases under water-flood development in the Mildred Pool of Navarro County, Texas.

Early drilling in the field was done by both cable and rotary tools, the latter predominating. Most wells were completed by setting 4 or 4½-inch pipe on bottom just above the uppermost sand member of the Nacatoch formation, and then drilling the two or three pay zones of the Nacatoch with a smaller bit. The field was developed rapidly until about 1906, and drilling continued sporadically until as late as 1926.

Many of the original wells have been plugged and salvaged, especially in some of the marginal areas. However, a majority of the wells are still producing. Until recently all of the wells were pumped by central power units equipped with crude oil fueled engines. Before the present drilling program was undertaken there were approximately 200 wells left on the pump, with an average production of from ⅓ to ½ barrel per well per day.

A five injection well pilot flood was installed on the McKinney lease in April, 1952. Following close observation of this flood, 52 more injection wells, arranged for a five-spot pattern, were drilled during the winter of 1952-53 on the McKinney, Hickey, Wright and Blackburn leases (See Figure 1). In drilling these and other wells, the Nacatoch formation was found to be approximately 150 feet thick and composed of three sand bodies separated by shale and sandy shale. The upper two sands were very poorly developed throughout most of the field, while the lower body was found to be very well developed, soft, friable and slightly bentonitic sand. The lower sand varies in thickness from 15 to 50 feet, with an average of 20 feet throughout the field. All new wells were set through the upper Nacatoch sands and completed open hole on the lower sand, which is the main pay zone of the Nacatoch.

Flooding Problems. Principal drawback to the Mildred pool as a water-flood prospect is the viscous nature of the crude. This varies considerably in the field, ranging from 13 to 95 centipoise for stock tank samples, with the gravity ranging from 24 to 29 degrees API. There appears to be a sharp dividing line through the center of the field, the higher gravity crude produced from the western half, and the more viscous crude from the eastern half. The oil in the western half of the reservoir varies from 13 to 15 centipoise, while the eastern

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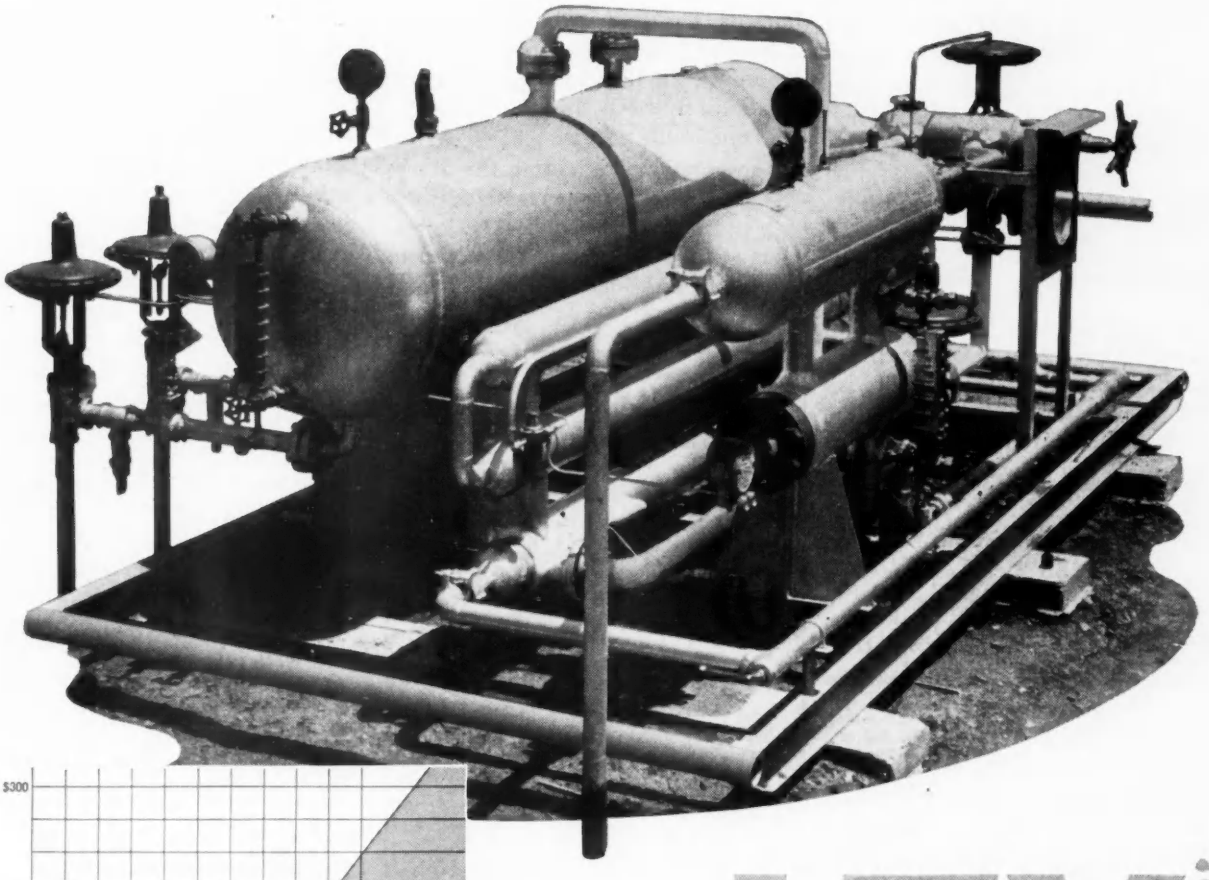

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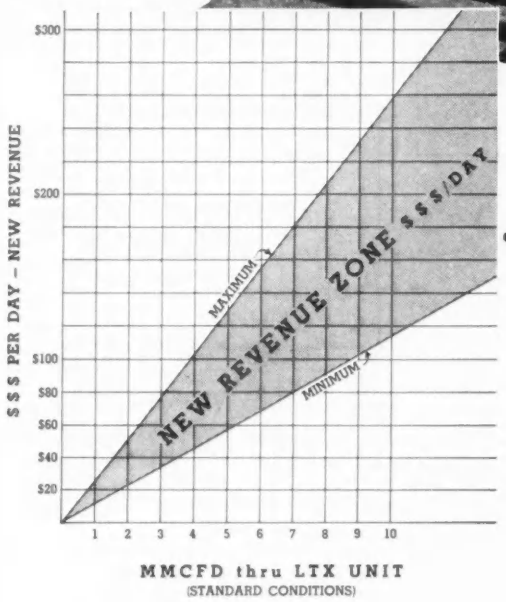

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half grades from 20 to 95 centipoise. Only a small portion of the reservoir produces oil over 40 centipoise.

As is well known, a high viscosity lends itself to a high mobility ratio which directly affects the sweepage efficiency before breakthrough. The calculated mobility ratio of 30 centipoise oil from this reservoir is 11.36, which of course is very high, and not conducive to building up a good oil bank ahead of the flood front.

Another unfavorable factor affecting this reservoir as a flood prospect is the amount of faulting observed in recent drilling. The field itself is trapped against the downthrown side of the big Mildred fault, which has a throw of 500 feet down to the coast. There appear to be at least three smaller fault zones paralleling the Mildred fault within the reservoir. The magnitude of throw of two of these is from 50 to 75 feet, while the southernmost fault zone is displaced from 150 to 200 feet. This latter zone is the southern limit of production in some parts of the field.

The third unfavorable factor is the presence of bottom water in the eastern half of the reservoir. The magnitude of this problem is unknown at the present time because no injection wells have been drilled in this area. From recent logs it has been determined that there exists at least 20 feet of water sand underlying at least 30 feet of oil sand in some parts of the field. Coffield & Guthrie and J. P. Fleet, Trustee, are at the present time planning a joint pilot flood operation to observe both the effect of bottom water and the higher viscosities found in the eastern part of the field. Until this pilot flood is installed, accurate predictions cannot be made concerning the effect of bottom water.

Favorable Factors. The one outstanding compensation for the high mobility ratio of water and oil in the reservoir is the very uniform distribution of permeability in the Nacatoch sand. Figure 2 shows a coregraph from a typical injection well. The permeability distribution will compensate for the high mobility ratio by allowing the greater part of the section to be flooded almost simultaneously, i.e., injection of water will be very uniform throughout the whole section. Thus a substantial percentage of the recoverable oil will be produced before any breakthrough of the flood front at the producing well. The pilot flood to date bears this out, in that no water in any measurable quantity has been produced in four of the five pilot wells. The water production in the fifth well has definitely been established as due to channeling from one of the inputs.

Another factor affecting this reservoir as a flood prospect is the very high porosity of the sand. The lowest average porosity in any well cored to date is 32 percent. Figure 2 shows a coregraph of a well with an average porosity of 36 percent. This characteristic of the Nacatoch sand lends itself to a very large amount of oil in place, with the most conservative calculations giving a minimum of at least 40 million barrels of oil in the reservoir. A recovery of only 10 percent of this amount will result in a very successful flood financially. Reason for this is the very low development cost for a flood installation at this depth. Drilling, electrical logging, and cementing is all done by the operator at a low cost. Average completion time for a Nacatoch well is approximately 36 hours from the time rigging up starts. Two-and-one-half-inch tubing is set and cemented in the oil wells, and 2-inch tubing set in the input wells. Pumping is done through a 1-inch "macaroni" string, thereby eliminating the cost of rods and tubing. With the above practices, the development cost of this reservoir should not be over $650 per acre for an 8-acre development pattern. This will include electrified individual pumping units and duplicate trunk flow lines so that each pattern well may be tested separately into a central battery. At that cost per acre the development cost of the entire reservoir should be approximately $1,600,000. Thus, even a poor water-flood recovery will result in a financial success. The additional 52 injection wells were drilled after observing the pilot flood for only eight months.

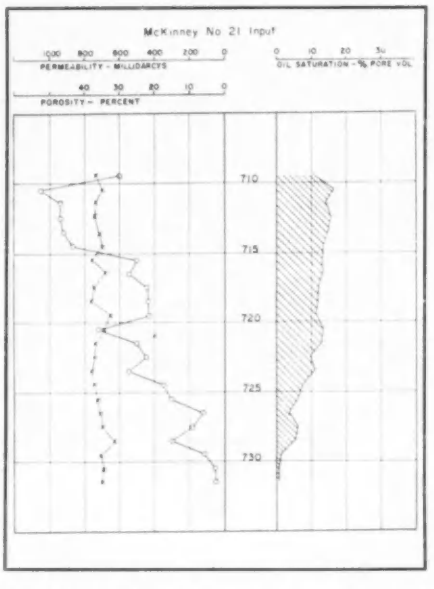

Fig. 2—Coregraph of typical input well showing uniform distribution of permeability and high average porosity.

Pilot Flood Results. Injection in the McKinney pilot flood was started in April, 1952, at a low rate. An attempt was made to hold the injection rate in the initial five wells, and subsequently in all 57 wells, between 20 and 25 barrels per day. Five oil wells adjacent to the original inputs were put into a separate tank where daily gages could be made. When the flood started, total production from these five wells was only 2 barrels per day. About 18 months later, production from these wells increased to 20 barrels of oil per day. The buildup of bottom-hole pressure in this area is evident in Figure 3, which is an injection curve for one of the pilot inputs. Bottom-hole injection pressure has increased from 400 to 950 pounds per square inch.

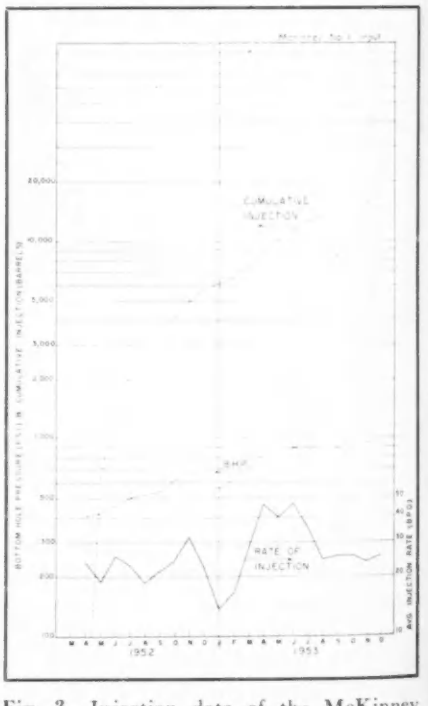

Fig. 3—Injection data of the McKinney No. 21, one of the pilot input wells.

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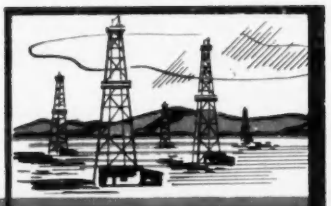

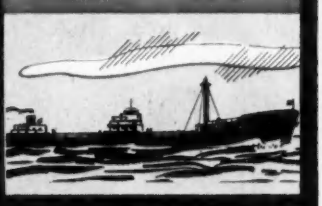

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input wells on the McKinney and adjoining leases, production has shown a steady increase on all four leases. The average bottom-hole injection pressure on all the leases is now 790 psi, as compared to 950 psi in the pilot area. Production has increased 300 percent on all the leases

Fig. 4—Production and injection history of four leases shown in Figure 1.

as compared to 1000 percent in the pilot flood. Figure 4 is a graphical representation of the production and water injection on the four leases now under flood. Water production to date is negligible.

In the spring of 1953, the injection rate was increased gradually from 25 to 40 barrels per day per well. Several cases of channeling from inputs to oil wells were noticed in the summer, with two particularly bad cases. These two wells were corrected by running radio-active input profiles to find the ruptures, squeezing with a mixture of cement and bentonite, and running a final profile to check results. Both severe cases were almost completely corrected with the resumption of normal uniform injection profiles. As a result of channeling, it was decided to resume the lower injection rate of 25 barrels per day. Since then there has been very little trouble due to channeling.

Estimated Recovery. The main pay of the Nacatoch has been extensively cored in wells drilled recently in the field. Due to the friable, soft nature of the sand, full recovery is difficult to obtain with standard coring equipment. Full recovery, with the resulting complete permeability profile, was achieved on three wells. Figure 2, showing the analysis of a complete profile on McKinney No. 21 input, is typical of the three curves. Partial recovery in the rest of the cores indicates there is very little deviation from this profile.

Additional information for use in recovery calculations was obtained by a special flood pot test. A large core was cut from the J. J. W. & H. Wright No. 6 input, and after many unsuccessful attempts, a plug finally was flooded. It was necessary to have the soft plug coated with plastic before a successful run could be made. By the restored state method, connate water was found to be 36 percent and the permeability to water was 114 millidarcys as compared to 885 millidarcys permeability to air. Both these figures indicate a relatively dirty sand, with a fairly high ash content.

Figure 5 shows the water cut and oil recovery curves for this test. With

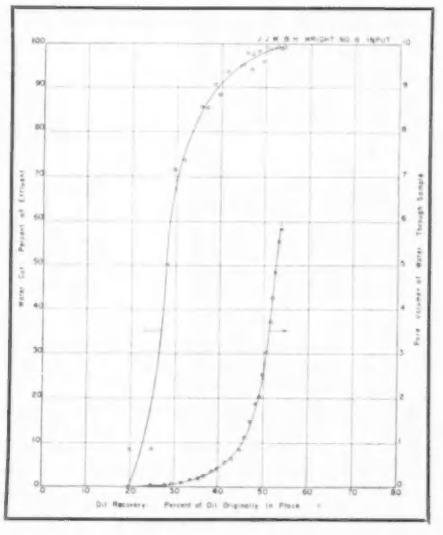
J. J. W. & H. WRIGHT NO. 6 INPUT
Water Cut - Percent of Effluent
Pore Volumes of Water Through Sample
Oil Recovery - Percent of Oil Originally in Place

Fig. 5—Water cut and oil recovery data based on flood pot tests made in the laboratory.

an economic limit of 95 percent water cut, 44 percent of oil originally in place was recovered, with a residual oil saturation of 36.5 percent of pore space. These measurements, of course, are for a steady state flow condition and cannot be taken as a direct indication of reservoir performance. The test was run to duplicate as nearly as possible actual reservoir conditions, and oil used in the flood pot was actually a stock tank sample from the Wright lease. It is believed that the resulting data of the test are very conservative.

Using the permeability profile of McKinney No. 21 input, a connate water saturation of 36 percent and a viscosity of 30 centipoise (twice the actual viscosity of the McKinney stock tank oil), a recovery of 4200 barrels per acre was calculated.

As is indicated by the flood pot test and also by theoretical calculations, a great deal of the oil will have to be produced at a high water cut. After breakthrough, the water cut will rapidly increase to approximately 80 to 90 percent, and then level off.

By all conservative calculations, average recovery for the entire reservoir should be at least 150 barrels per acre foot, or 3000 barrels per acre. This will give a total recovery of 7,500,000 barrels of oil, thus making the secondary recovery equal to primary recovery.

Development Plans. Additional development in the field is pending, awaiting further results from the area now under flood. There are approximately 440 productive acres now partially developed. Plans are to plug all existing oil wells not fitting the injection pattern and drill any new wells necessary to complete the flood. They have approximately 1800 additional acres with no secondary development which will be developed in a similar manner. At the present time, injection water is piped from a Wolf City flood two miles to the north of the Mildred pool.

With additional input wells, it will be necessary to drill at least one more supply well to the Woodbine sand. The supply well will be about 3000 feet deep, and water will be lifted with a submerged centrifugal pump. A supply well will furnish approximately 6000 barrels of water per day, therefore one more should be sufficient. The Woodbine water requires no treatment whatsoever. A central water treating plant will be built to treat all the return water, which will be produced in considerable quantity in the later stages of the flood.

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Fig. 1—Electric pilot control panel which registers variation in hole diameter while caliper survey is run.

Water Shut Off at Hugoton

Data provided by spinner and caliper surveys to determine best method of handling water problem.

By M. M. SORENSON, Dowell Incorporated, Borger, Texas

GAS WELL OPERATORS in the giant Hugoton Gas field of the Texas Panhandle and Oklahoma are finding themselves faced with an ever increasing production problem. As the formation pressure decreases, water encroachment is becoming more and more severe. At the present, in most cases, it is possible to shut the wells in and drive the water from the well, but as the wells are produced water again fills up in the hole.

The most convenient method of handling this problem is by the use of a siphon string. A still more satisfactory method is to shut off completely the water producing zone.

The most commonly employed method of determining water entry into a gas well is by the use of a float on a wire line. When the water reaches a predetermined level, the well can be shut in and the water level followed down the hole until it becomes static, or the water is driven completely from the well. In most of the wells in this field, the water is coming from the bottom zone, facilitating the plugback operations.

Gas Zones Checked. It is important, however, in sealing off the water zone, that accurate information be available regarding the relative gas productivity of the different zones in the well, so that no substantial gas producing zones will be shut off at the same time. In order to avoid this, an electric pilot spinner survey is frequently conducted, which will accurately determine the percent of production of gas from each zone, or the amount of fluid entering each zone. If the tool is to be run in open hole, it is necessary to have an accurate knowledge of any variations in hole diameter, in order to properly evaluate the volume of gas passing the spinner at any given point. This information is usually obtained by means of a caliper survey. As the tool moves up the hole, any variation in diameter is detected and transmitted electrically up the pilot cable to the electric pilot control panel shown in Figure 1.

This measurement of hole size is not only used as an aid to measure gas flow from each zone, but also to establish future reference points when the well is plugged with plastic. In this manner, it is possible to mark a very definite plugback point above a shale section.

As the open hole is subsequently traversed with the spinner, the well is opened to allow each zone to produce gas. From the resulting log, percent of production of each pay zone can be determined. After the caliper and spinner surveys have been completed, results of both surveys are correlated and entered on survey charts.

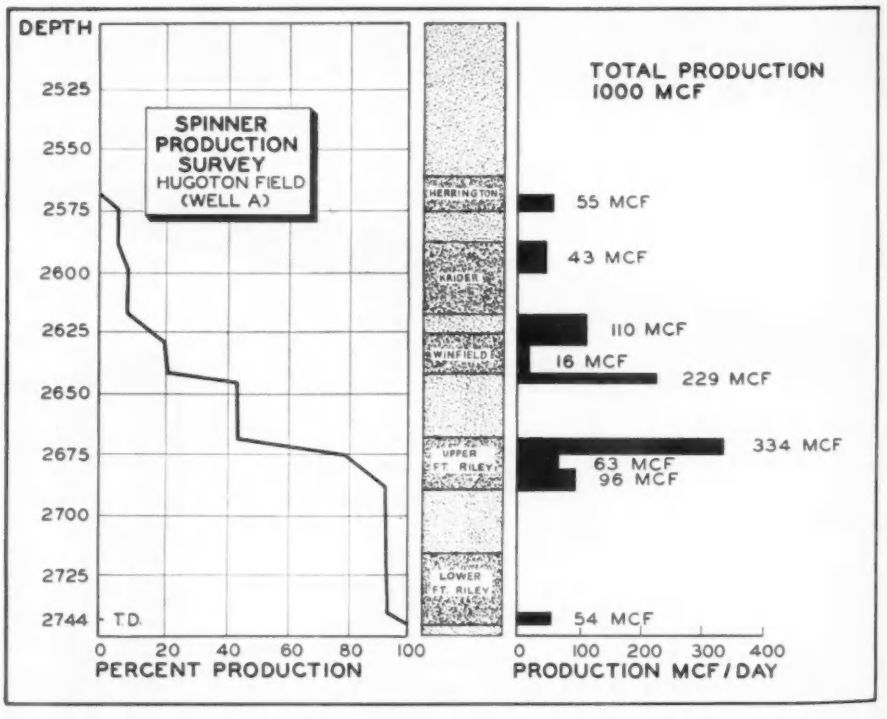

Fig. 2—Spinner survey in this well indicated very low production from bottom gas zone which was later plugged off completely.

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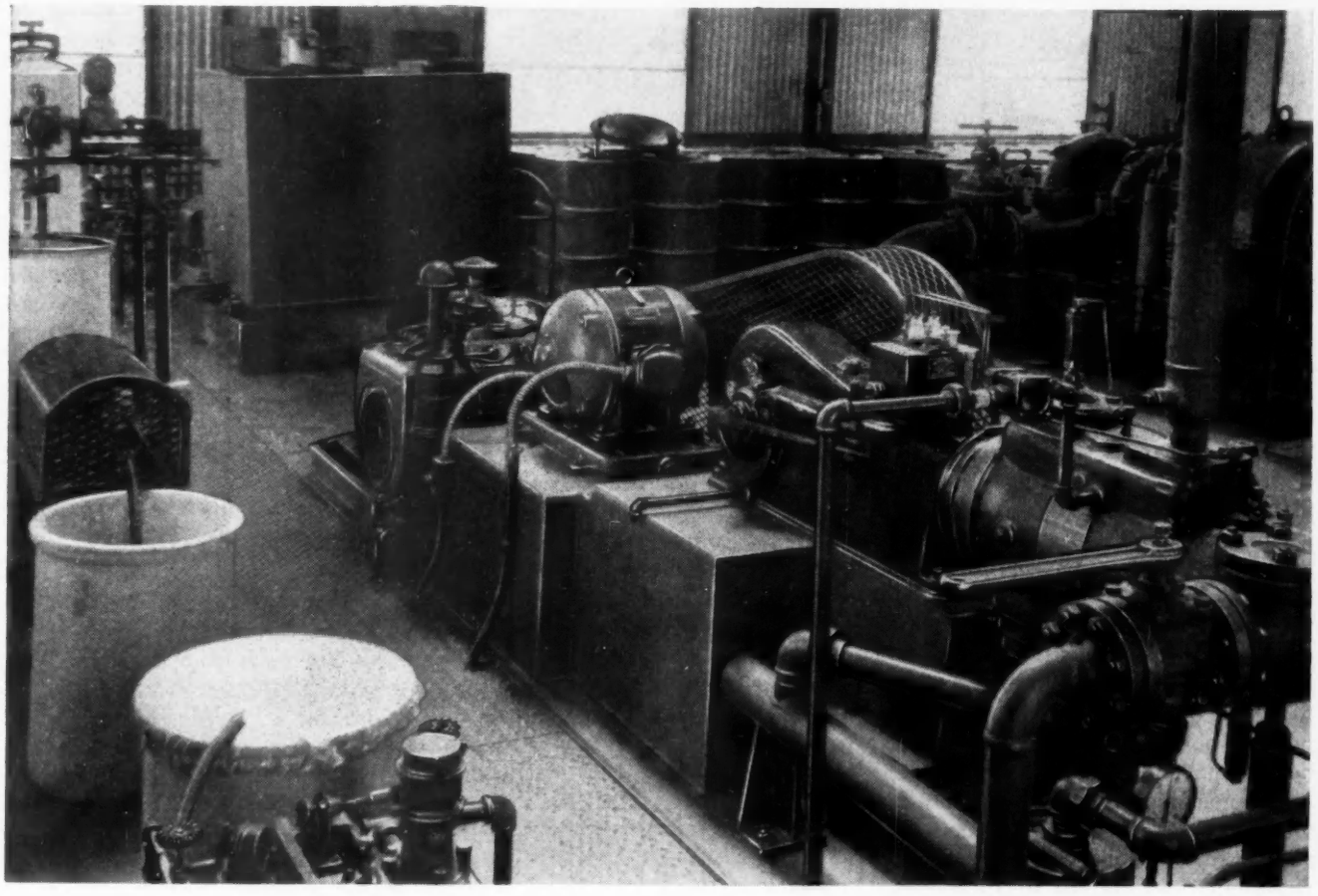

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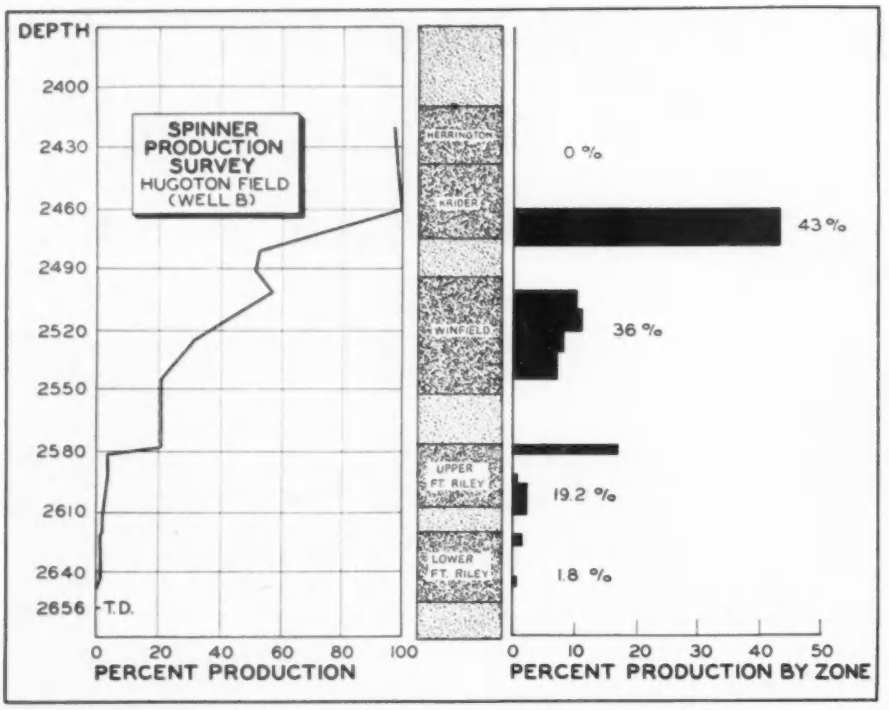


Fig. 3—Spinner survey of another Hugoton gas well showing very little gas production from Lower Fort Riley formation.

Spinner Surveys Used. A spinner survey facilitates the application of a plastic shutoff in a number of ways. Frequently it can be determined how far back to plug the hole in order to seal off the water, with a shale section between the water zone and the gas pay. If the plugback point is known in advance, it is also possible to reduce the amount of plastic necessary to obtain a shutoff. The open hole is partially filled with Ottawa sand, then a plastic cap put on top of the sand and squeezed with well gas pressure or a gas compressor. Approximately 60 percent less plastic is required to obtain a shutoff when the plugback point has been determined before plastic work is undertaken.

Sometimes the spinner survey indicates that a large amount of gas is being produced from the lower zone. In order to obtain a complete water shutoff, it also would be necessary to shut off a large amount of gas. In such a case, it might be preferable to use a siphon string to eliminate the water, instead of a plastic plug.

A spinner survey is shown in Figure 2. It may be noted that in this well the amount of gas being produced from the lower Fort Riley was comparatively small. Thus, it would not be too detrimental to the well's total production, if this zone were shut off. Such a procedure might be desirable if by so doing it would materially improve the effectiveness of the bottom-hole plug.

The surveys indicated that a very definite shale section was present between the upper and lower Fort Riley. By plugging back to the bottom of the upper Fort Riley, a permanent shutoff could be obtained to that zone. It may be noted in this particular case the total depth of the well is 2744 feet, and the bottom of the gas zone in the upper Fort Riley is at approximately 2687 feet, a difference of 57 feet. In plugging this well, the well bore could be filled with Ottawa sand to 2692 feet, or 52 feet of fill-up. A five-foot plastic cap could then be placed on the sand and squeezed, thereby saving the plastic necessary to fill the lower 52 feet of hole.

Plugback Depth. By using surveys such as this, a definite plugback point can be determined, minimizing any possibility of failure in the subsequent plastic plugging operations. In addition, should future water entry from another zone require further remedial work at a later date, this survey will give material assistance in planning the workover operations.

The value of preliminary spinner surveys, prior to conducting acidizing operations, should not be overlooked. It has been found by conducting permeability surveys, that in approximately 80 percent of all wells surveyed, the zones that produced the most gas did not take the most acid. In most cases, the largest producing zones received only 5 to 20 percent of the acid.

Figure 3 shows a production survey of another gas well in the Hugoton field. In this case, most of the production was from the upper zones with only 1.8 percent from the lower Fort Riley. A permeability survey of this same well, shown in Figure 4 in-

Continued on Page 189

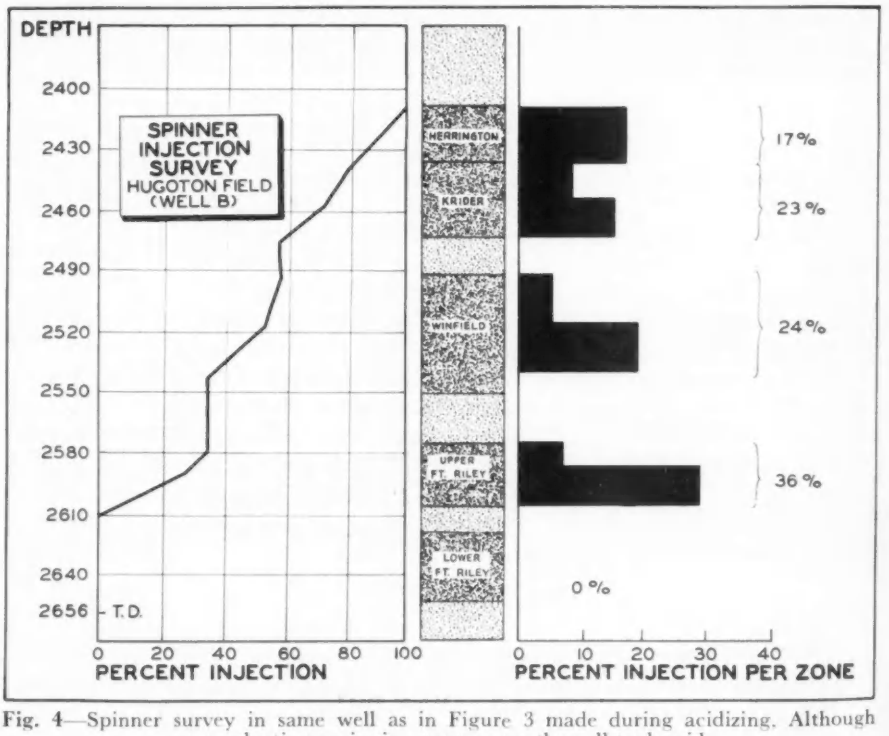
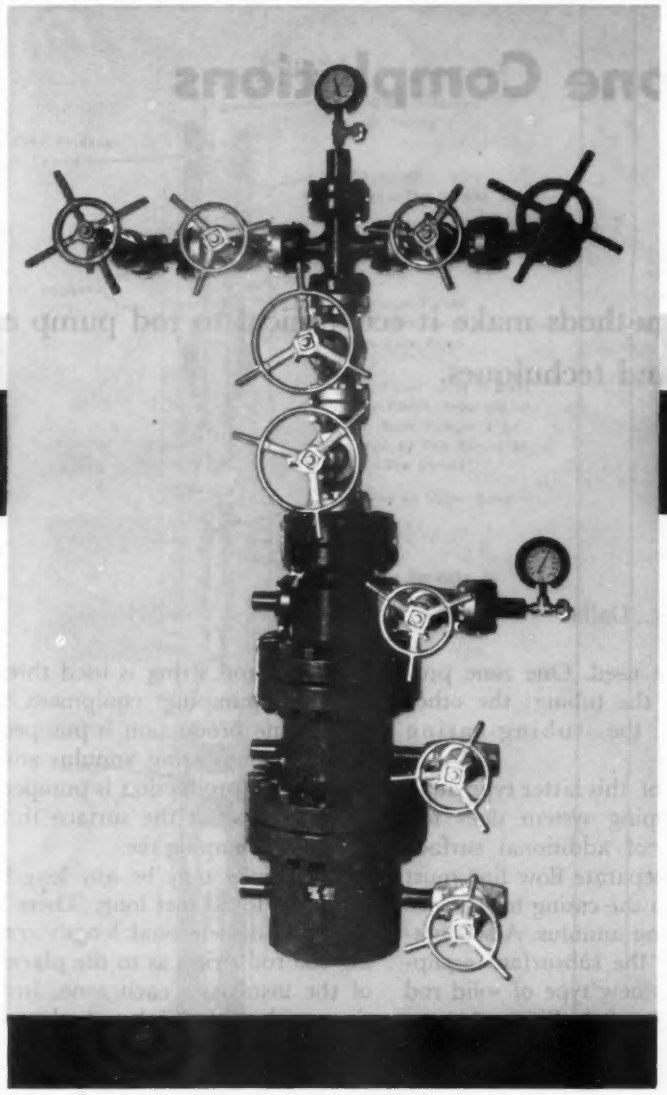
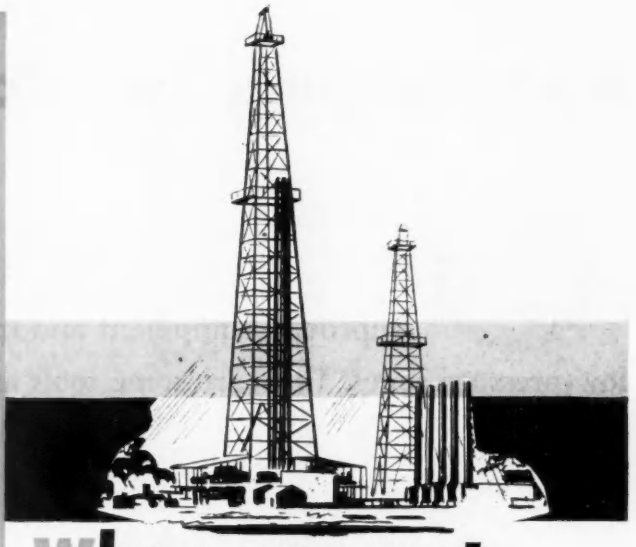


Fig. 4—Spinner survey in same well as in Figure 3 made during acidizing. Although gas production varies in upper zones, they all took acid.





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Rod Pumping Two-Zone Completions

Improved equipment and methods make it economical to rod pump dual low-pressure zones. Here are some tools and techniques.

By DONALD F. TAYLOR, JR., Otis Pressure Control, Inc., Dallas

TWO SINGLE-WELL completions, or one dual-zone completion? This is the choice which operators producing multi-zone fields often must make. Flowing wells generally do not present the problems normally associated with artificially lifting dual-zone completions. However, improvements both in equipment and in techniques of rod pumping dual zones offer definite advantages over drilling twin wells which must be lifted separately.

There is more than one method of artificially lifting fluids from two zones in a single well bore. Those methods outlined in this article pertain to rod pumping where a conventional pumping unit is used, and where sucker rods actuate the subsurface pumps. In the rod pumping category, there are two main types:

1. Intermittent pumping. This method uses only one subsurface oil well pump which alternately produces one zone for a definite period, then the other. The pump is lowered or raised by equipment on the surface.

2. Simultaneous and Separate-Zone Pumping. Two subsurface pumps are required here, and each are interconnected so that they have the same stroke when operating together. There are two distinct classifications of two-zone rod pumping: (a) Use of hollow sucker rods to pump one zone while the second zone is pumped into either the tubing-casing annulus or the tubing-rod annulus; and (b) The solid rod type which connects both pumps. Standard API sucker rods are used. One zone produces through the tubing; the other zone through the tubing-casing annulus.

Installation of this latter type dual-zone rod pumping system does not entail the use of additional surface equipment. A separate flow line must be connected to the casing to produce the casing-tubing annulus. A schematic diagram of the subsurface equipment used in a new type of solid rod dual pump is shown in Figure 1.

There are four main assemblies of this dual pump (Figure 1): (1) a positive displacement pump to produce the upper pay; (2) a crossover device within an annular style packer that has separate passages for fluids from both pays; (3) a polished rod attached to the upper plunger that actuates a lower pump with a packoff unit separating both zones within the tubing; and (4) a positive displacement pump to produce the lower pay.

An additional packer must be used in all dual wells to separate the producing horizons. Although this packer is not considered a part of the pump, it is very important that the packer have certain mechanical features in order to be effective in dual pumping. These features are: (1) no part within the packer should move during the pumping cycle; (2) the packing elements should set positively with very little or no load being applied from the tubing string; (3) the slips should have a large contact area, and (4) the minimum internal diameter of the packer should not be less than the tubing ID.

A solid rod string is used throughout the pumping equipment. The lower zone production is pumped out of the tubing-casing annulus and the upper zone production is pumped out of the tubing at the surface through a regular pumping tee.

The stroke may be any length desired, up to 20 feet long. There is no practical dimensional length restricting the rod string as to the placement of the intake of each zone. Installations with 40 feet between the seat of each pump have been made; likewise, an installation has been experienced with a distance of some 2180 feet between pumps.

The upper positive displacement type pump connects directly into two of the main assemblies. This upper pump may consist of one of two basic types of oil well pumps: It may be either a tubing-type or a rod-type pump. These pumps also use metal plungers. The tubing-type may use either a common working barrel or a tubing-liner barrel. The rod-type pump may consist either of a regular barrel tube or a liner barrel, and for the present time, the barrel is stationary with top and bottom seals and hold-downs.

The annular packer employs synthetic rubber cups to seal against the casing and prevent flow past the packer under very low or high-pressure differentials. Likewise, this packer is designed structurally to withstand very high-pressure differentials either internally or externally. Built into it is a crossover device in the metal parts of the packer. This

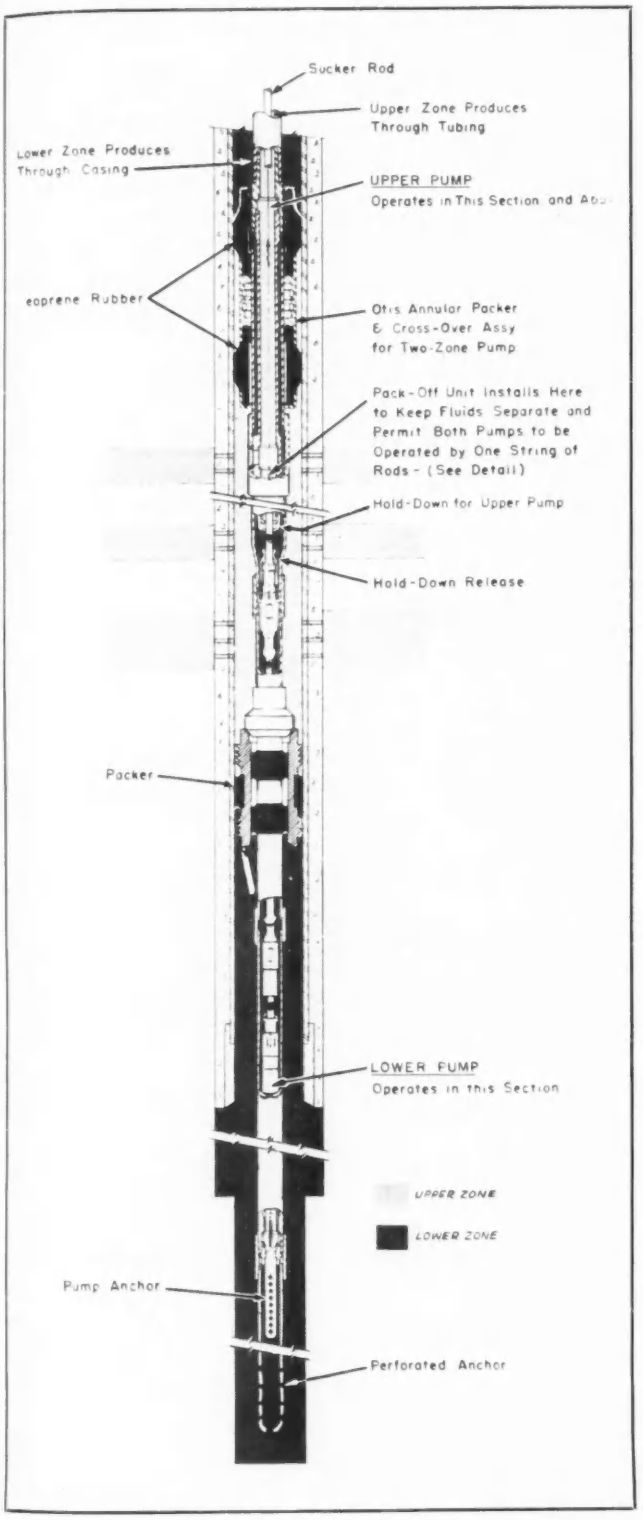
Sucker Rod
Upper Zone Produces Through Tubing
Lower Zone Produces Through Casing
UPPER PUMP
Operates in This Section and Abo
eoprene Rubber
Otis Annular Packer & Cross-Over Assy for Two-Zone Pump
Pack-Off Unit Installs Here to Keep Fluids Separate and Permit Both Pumps to be Operated by One String of Rods - (See Detail)
Hold-Down for Upper Pump
Hold-Down Release
Packer
LOWER PUMP
Operates in this Section
UPPER ZONE
LOWER ZONE
Pump Anchor
Perforated Anchor

Fig 1 — Complete two-zone pumping hookup (left) showing four main assemblies.

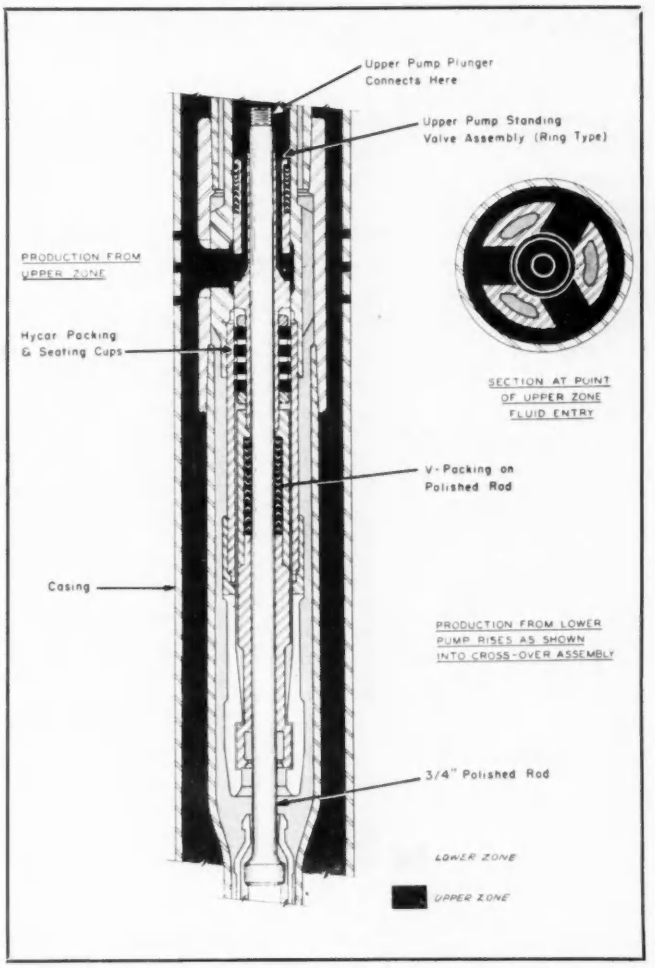
Upper Pump Plunger Connects Here
Upper Pump Standing Valve Assembly (Ring Type)
PRODUCTION FROM UPPER ZONE
Hycar Packing & Seating Cups
SECTION AT POINT OF UPPER ZONE FLUID ENTRY
V-Packing on Polished Rod
Casing
PRODUCTION FROM LOWER PUMP RISES AS SHOWN INTO CROSS-OVER ASSEMBLY
3/4" Polished Rod
LOWER ZONE
UPPER ZONE

Fig. 2—Packoff unit (above) below annular packer shown schematically.

crossover consists essentially of a horizontal tube arranged to by-pass a vertical tube. Attached below the crossover is a nipple arranged internally to allow a packoff unit to come to rest within it. Beneath this nipple is a set of outer clutch prongs for properly locating the packoff unit.

The solid down-the-hole polished rod that connects the upper pump to the lower segment of sucker rods is ¾ inch in diameter. Surrounding the rod is a standing valve and packoff unit that uses API sealing cups on the outside to separate the two pays within the internal nipple. Beneath the seating cups and located inside the packoff is the packing which seals against the polished rod and forms a down-the-hole stuffing box. This inside, or rod, packing is a self-adjusting type of V-packing of a composition suitable for withstanding very high-pressure differentials at elevated temperature for prolonged periods. Beneath this packoff unit is a special, square-shouldered hold-down which is designed to come to rest in the recess of the outer clutch prongs. Above this packoff unit is placed the annular ring-type standing valve for the upper pump. This valve has the unique feature of operating around the down-hole polished rod and is run and pulled on the rod string, and thus forms a true upper zone standing valve (Figure 2).

The lower pump may either be a tubing type pump, or a rod type pump. The tubing type pump may be as described earlier. The rod type pump, with certain modifications made externally, may be a rod stationary barrel or a rod traveling barrel, and is always equipped with a bottom lock hold-down.

Continued on Page 182

Selecting equipment important in dual-zone systems . . .

When considering the use of dual pumps, several factors enter into the economics of the operation which will affect the decision to dually complete a well. These factors will usually be the same with the exception that one factor differs only in new-well and old-well practices. Some of these are outlined below:

1. Completion practice (involves materials and services):
   A. New-well completion:
      (1) Landing the casing, or oil string on top, or through the lower zone.
      (2) Effecting a positive seal between the selected zones outside of the casing.
      (3) Testing the casing, and the cementing operations encountered while accomplishing the first two operations.
   B. Old-well recompletion:
      (1) Deepening to a new zone.
      (2) Recompleting up the hole into a previously passed-up productive zone.
      (3) Reopening a previously non-commercial productive zone which may be produced commercially with the use of a dual pump.
   C. Operations applicable to both new-and-old well recompletions:
      (1) Testing each zone independently for oil, water, or gas production (this may be done in the drilling stages, or the re-work stages; however, the subsequent (interim) operations may have had an adverse effect on the productive zones. Therefore, it usually is advisable that this operation be performed after the casing is landed, or after formation treatments, etc.).
      (2) Sand-face or formation treatments (this may be feasible prior to the productive testing, or at any time desired during the completion phase).
      (3) Well bore cleanup (may involve several operations; however, this is important for the successful operation of any dual completion, pumping or flowing).
2. Tubular program required for dual pumping.
3. Sucker rod program required.
4. Surface equipment required:
   A. Pumping unit, gear box, engine, etc.
   B. Flow lines required.
   C. Tankage and metering facilities required.
5. Operating practices which apply to the area.

These factors may actually be resolved into cost. Offsetting this cost, and affecting the application also is the expected return in terms of barrels of oil and cubic feet of gas, which may be converted into dollars and cents. This may be termed "additional payout."

In order to select equipment in a logical manner, it is necessary to predict, with reasonable accuracy, the loads and stresses which may be expected while operating a two-zone pump. The calculated loads placed on the polished rod will determine the size of the pumping unit to be installed. The practicing theory is to install the largest unit with the longest stroke that will ever be needed to obtain the desired production from that individual well.

The effective areas of the two plungers affect the loads placed on the rod string. These areas, for load purposes, may be added. The weight of the sucker rods influences the load on the polished rod at the surface. The same considerations in regard to stress loads, peak torque, and other limiting factors will apply to dual installations. The capacity of the pump for the upper zone is reduced by the amount of the area of the rod below the upper plunger on each up-stroke. This "effective" displacement capacity of the upper plunger, for convenient calculation purposes, may be stated as an equivalent plunger diameter, and as such, may be used to calculate volumetric production (Table 1).

Table I

Dual Pump Plunger Combinations and Critical Data

Minimum Tubing I.D. (Nominal) O.D.		2½″ 2¼″	2½″ 2″	2½″ or 2″ 1¾″ + 40	2″ 1½″	2″ 1¼″
Upper Plunger	Area, Sq. In.	3.976	3.142	2.513	1.767	1.227
	Displacement Area, Sq. In.	3.536	2.700	2.061	1.325	0.785
	Displacement, Diameter, In.	2⅛″	1 55/64″	1⅝″	1 19/64″	1″
	Available Pump Type	Tubing	Rod	Tubing or Rod	Rod	Rod
1¾″ Lower Plunger	Area, Sq. In.	2.405	2.405	2.405	2.405	2.405
	Percent Capacity of Upper Plunger	68.1	89.2	116.1	182	352
	Available Pump Type	Tubing	Tubing	Tubing	Tubing	Tubing
	Otis Type Designation for Upper Plunger.	A or B	G or H	A or B	G or H	G or H
1½″ Lower Plunger	Area, Sq. In.	1.767	1.767	1.767	1.767	1.767
	Percent Capacity Upper Plunger	50.8	65.4	85.2	133	225
	Available Pump Type	Rod	Rod	Rod	Rod	Rod
	Otis Type Designation for Upper Plunger.	C or D	E or F	C or D	E or F	E or F
1¼″ Lower Plunger	Area, Sq. In.	1.227	1.227	1.227	1.227	1.227
	Percent Capacity, Upper Plunger	34.7	45.4	59.2	92.5	156
	Available Pump Type	Rod	Rod	Rod	Rod	Rod
	Otis Type Designation for Upper Plunger.	C or D	E or F	C or D	E or F	E or F
1 1/16″ Lower Plunger	Area, Sq. In.	0.887	0.887	0.887	0.887	0.887
	Percent Capacity, Upper Plunger	25.1	32.4	42.8	66.9	113
	Available Pump Type	Rod	Rod	Rod	Rod	Rod
	Otis Type Designation for Upper Plunger.	C or D	E or F	C or D	E or F	E or F

Installing a dual-pump system . . .

Having decided upon the proper equipment, the well must be prepared for the dual-pump installation. Once the well has been perforated or opened to the pay zone by other means, it is good practice to clean the well thoroughly of any sand, scrap

formation material, or other matter. Each zone should be accurately tested for productivity. As an added precaution, it is advisable to scrape the pipe to insure the best possible seal between casing and tubing.

Running in equipment. A dual pump must be accurately and carefully installed. For instance, the distance between pump seats in the tubing string must be measured accurately and the correct length of rod string installed. The installation may be run inside five-inch OD, or larger, casing. Tubing of two-inch diameter or larger may be used in the well. The upper pump seat, annular packer, crossover fitting, tubing segment between the upper and lower pumps, and the lower pump seating shoe are made up in the tubing string and lowered to the desired depth in the casing. The lower packer is set, and predetermined weight is placed on the packer. The weight should be slightly greater than the amount of force that the tubing string will be relieved of on the upstroke of the pump plungers during the pumping cycle. After the tubing is landed, preparations are made to run rods and the remaining portions of the two pumps.

The lower pump (or plunger) is attached at the lower end of the sucker rods. The length of the sucker rods to be run between the pumps must be tallied so that the upper and lower plungers will be spaced properly in each barrel. A special coupling is attached to the upper end of this segment of rods. The function of this coupling is to join the solid polished rod with the lower segment of sucker rods and to carry the rod pack-off unit and upper pump standing valve into their proper seat. The top of the polished rod is joined to the upper plunger or pump by means of a special cage. The top of the upper pump plunger connects to the sucker rods, which extend to the surface.

As the rods are lowered into the tubing, the lower pump passes through the upper pump barrel (or seat) and the clutch prongs of the hold-down

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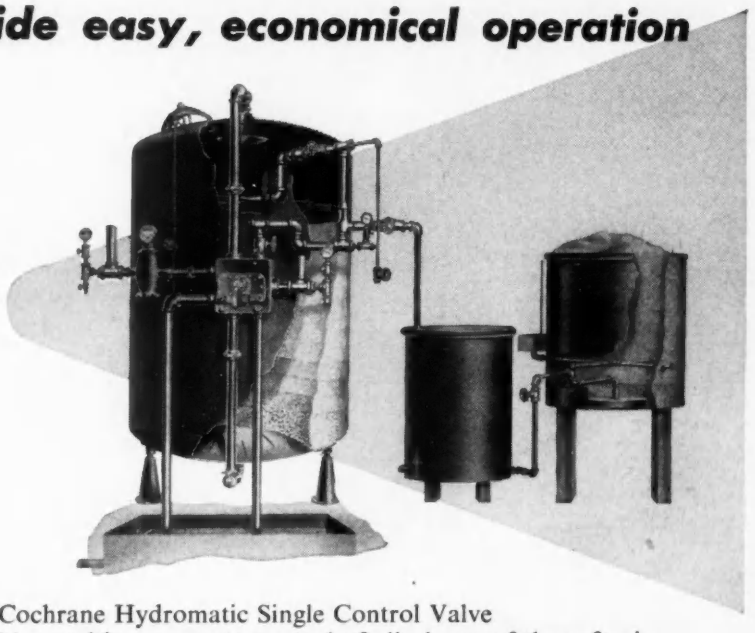

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Nothing but the finest will ever bear the name of

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unit. The packoff unit and upper pump standing valve also pass through the upper pump barrel. As the special coupling passes the outer clutch prongs, the square shoulders of the special hold-down are stopped. This correctly positions and anchors the packoff unit and the upper pump standing valve. As the rods are lowered further to the bottom of the normal down-stroke, the upper and lower pumps are landed in their seats. After the installation of a conventional stuffing box and polished rod at the surface, the dual pump is ready for operation.

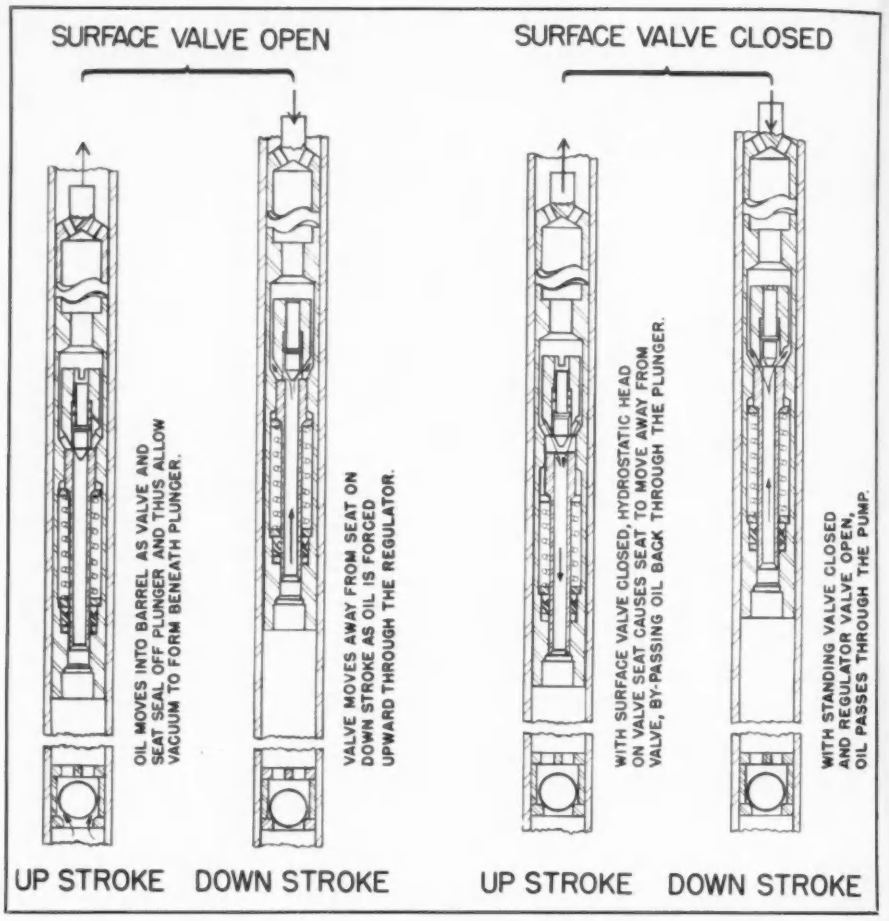
SURFACE VALVE OPEN
SURFACE VALVE CLOSED
OIL MOVES INTO BARREL AS VALVE AND SEAT SEAL OFF PLUNGER AND THUS ALLOW VACUUM TO FORM BENEATH PLUNGER.
VALVE MOVES AWAY FROM SEAT ON DOWN STROKE AS OIL IS FORCED UPWARD THROUGH THE REGULATOR.
WITH SURFACE VALVE CLOSED, HYDROSTATIC HEAD ON VALVE SEAT CAUSES SEAT TO MOVE AWAY FROM VALVE, BY-PASSING OIL BACK THROUGH THE PLUNGER.
WITH STANDING VALVE CLOSED AND REGULATOR VALVE OPEN, OIL PASSES THROUGH THE PUMP.
UP STROKE
DOWN STROKE
UP STROKE
DOWN STROKE

Fig. 3—Overload valve (in open and closed positions) has been used to control production.

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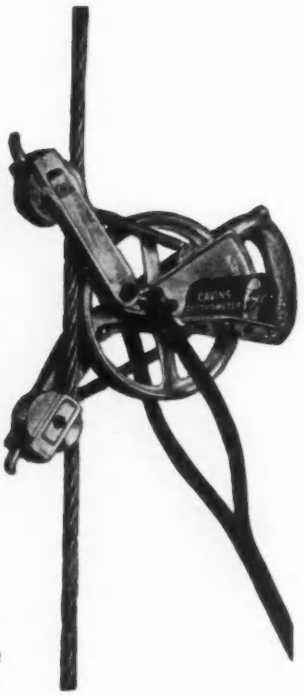

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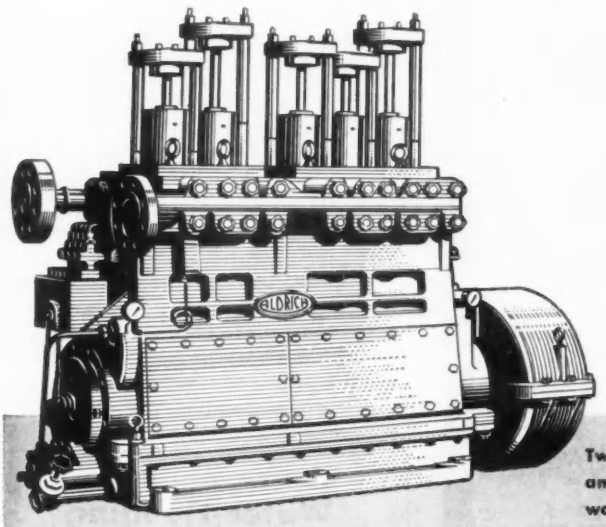
Production control from either zone . . .

Production from either zone may be accurately controlled. This may be accomplished by various methods in addition to varying the number and length of the strokes:

1. Variation in relative sizes of pump plunger (see Table 1).
2. Actual disconnection of the lower pump by manipulation of the rod string.
3. Regulation of production below that of the pump capacity. The use of an overload valve has been adopted for pumps to provide a variable control over the volume of fluid produced through the pump (Figure 3). This traveling overload valve allows the produced fluid to be by-passed through the plunger on the upstroke and through the pump on the downstroke when the surface valves are closed. Under this arrangement a high potential

For UNINTERRUPTED water flooding service

. . . it will pay you to use Aldrich Direct Flow Pumps

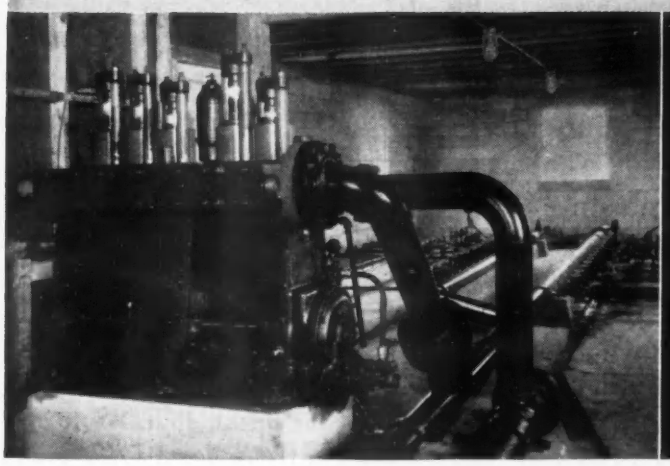


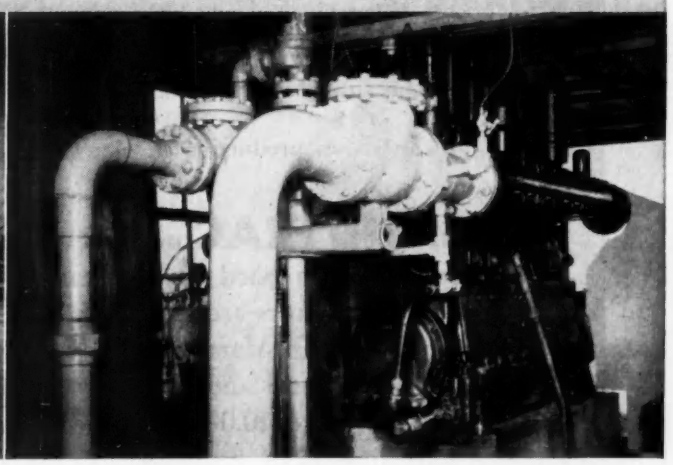
Their record will tell you why. On a large number of water flood projects throughout the country, Aldrich Pumps are providing continuous operation at high pressure . . . critical "musts" in this form of secondary recovery. Operators have found them not only dependable, but also highly efficient.

For water flooding Aldrich can supply you with a pump to meet any volume or pressure requirements you may have. Aldrich Pumps range from a 3"-50 hp triplex, through 5" triplex and multiplex, to the 6" series ranging up to 900 hp.

Get in touch with your nearest Aldrich Representative . . . or write us directly. Data sheets are always available upon request.

Two Aldrich Direct Flow Pumps on the job on water flood operations. At left is an Aldrich 5" stroke motor-driven Quintuplex Pump used for pumping salt water at the Osage #2 property of Winona Oil Company, Flat Rock, Okla. On the right is an installation at Skiles Oil Company, Mt. Carmel, Ill., where a similar Aldrich unit pumps fresh water at 120 gpm against 1450 psi.





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zone can be completely shut in after it has produced its allowable.

Protection Against Paraffin. As a protection against an accumulation of paraffin in the tubing and in the annulus, paraffin scrapers can be installed on the sucker rod string and a valve placed in the tubing below the paraffin belt so that warm oil may be circulated at intervals as may be found necessary. The use of hollow sucker rods for the circulation of warm oil has been successful in some areas.

Well Servicing. Generally speaking, the frequency for pulling the rods for a dual pump is about the same as for single pumps. A pump workover job takes a little longer than for a single pump, but only because two pumps must be serviced.

It has been considered advisable in some cases to leave the derrick in place so that the sucker rods can be hung in the derrick when the well is serviced. This practice makes it easier to keep the rods, tubing, and pump parts clean and free of sand and dirt.

Dual Pumping in Infancy. Dual pumps have proved that dual wells can be produced without commingling the fluids from two separate horizons after the wells cease to flow. The successful operation of this equipment has served to produce two horizons without the expense of drilling two wells.

There should be little doubt as to the initial savings made in drilling one hole and dually completing a multiple-zone well. It is believed that the era of dual pumping wells actually is in its infancy and will grow to take its place among the other standard producing methods in the petroleum industry.

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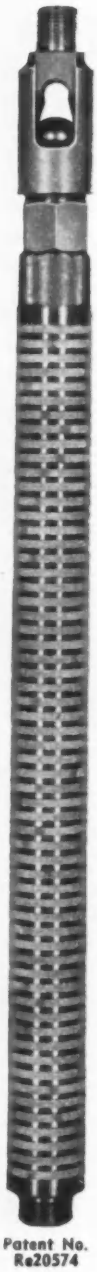
—The End



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2. Lasts for years.
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Watch for it!

Hugoton

Continued from Page 176

dicated that although the percentage of gas production from the various zones differed, practically all of the formations were taking acid except the bottom zone. In this particular well, a plastic plugback to the top of the upper Fort Riley would be indicated. It may also be observed that the Herrington and Upper Fort Riley received 53 percent of the total volume of acid injected, whereas they accounted for only 19.2 percent of the gas production. This would indicate that selective acidizing with the aid of temporary plugging materials would be beneficial on future acidizing operations.

Other Benefits. There are a number of benefits to be derived from running spinner and caliper surveys, in addition to those already described.

- For locating casing seats.
- As a guide to future open hole shooting operations (shoot into pay zones and not into shale sections).
- Location of shale sections for setting of cave-catchers.
- Location of formation packer seats.
- Guidance in planning future workovers, including both water shutoffs and re-acidizing.

The use of plastics for shutting off bottom-hole water has become well established during recent years. Pumped into the well as a fluid, these thermo-setting plastics partially penetrate the formation before hardening. This results in a positive bond between the plastic plug and the rock, and minimizes any possibility of subsequent channeling.

The above described combination of electric pilot surveys followed by plastic plugging, has successfully solved the problem of bottom-hole water in a large number of wells in the Hugoton gas field. In addition to locating an optimum plugback point, and allowing more economical application of plastic, it is possible to know in advance how much gas production will be lost by the plugback operation. On the basis of these data it is possible to decide which of two methods for handling this water problem will be used—the siphon string method or plastic plugging.

—The End

Completion

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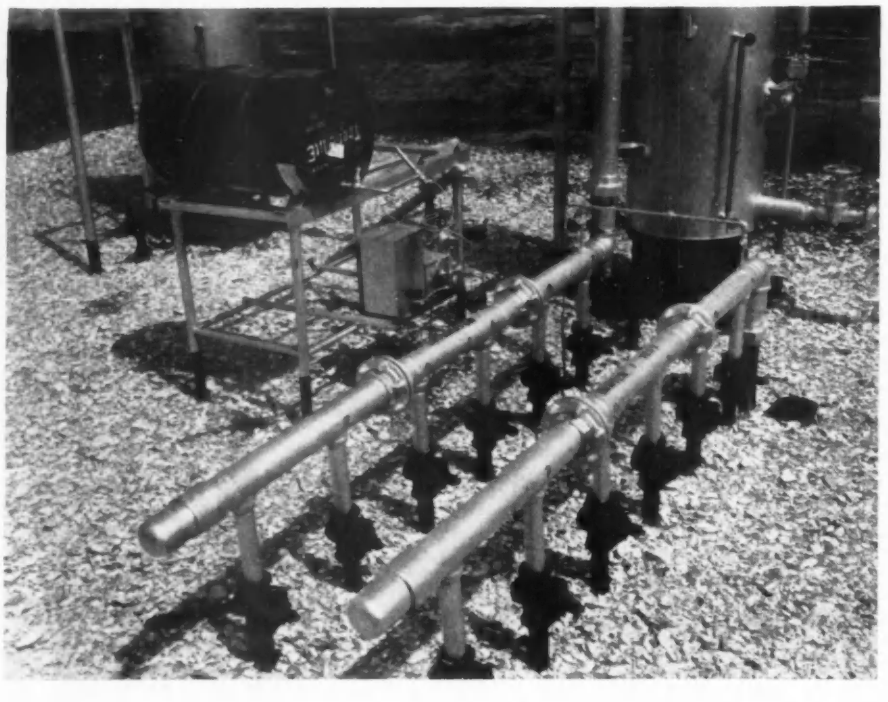
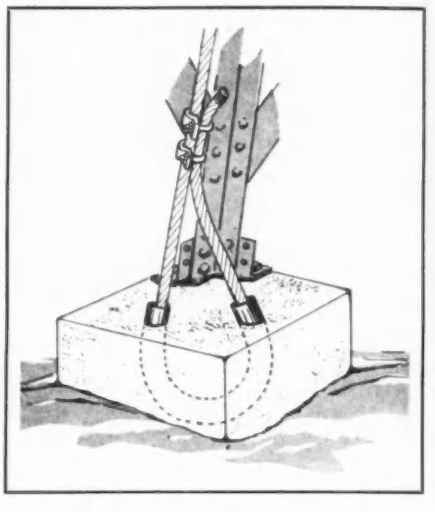


Flow Line Manifold Can Be Extended

One of the interesting features of this flow line manifold is that of enlarging it when desired. Individual flow lines from producing wells are buried underground extending to the right of this photograph.

Flow lines from six wells connect into two headers. One header carries production into the separator; the other takes fluids to the heater-treater and test separator. Each header is made in sections which are flanged together as shown. Each section is of four-inch pipe about four feet in length. Flow lines from two wells tie into each header through a plug valve which controls direction of flow. Ends of both headers are bull plugged so that at any time in the future, additional header sections can be flanged on to existing facilities to handle other wells.

Another feature of this hookup is the chemical injection system. Demulsifying agents are injecting into the header at the far end so that all production flowing into either the separator or heater-treater carry adequate chemicals. The chemical injector, driven by gas power, is located in the background and is mounted on a box frame structure that supports the drum of chemicals. Discharge of the chemical pump ties into both headers through a one-fourth-inch line extending across the tops of both headers. Needle valves in this line control the amount of chemical injected into each header. Each header is clearly marked, and each flow line connection identified so that the pumper has no difficulty in changing flow from one header to the other, or closing in a well.



Dead Line Anchor Held In Concrete Foundation

When pumping derricks are installed over producing wells, it usually is necessary to provide a sturdy deadline anchor for a pulling unit. Here is a simple, time-saving and solid anchor for the dead line of such pulling units when setting up to work over the well. The deadline anchor was incorporated in one of the concrete foundations which support the production derrick.

The anchor or hold-down consists simply of a section of four-inch pipe bent in a U-shape as shown and inserted in the foundation form prior to pouring the concrete. The pipe is bent smoothly in order to avoid any sharp projections in the pipe which would injure or cut the anchored line. Bottom of the pipe loop extends to the very bottom of the concrete foundation, with the upper ends extending 8 or 10 inches above the top of the foundation as shown.

After the pulling unit has been centered with respect to the well, the winch line is paid out and threaded through the crown and travelling blocks. Dead end of the line is then threaded through the bend pipe in the concrete foundation and securely fastened with wire rope clips.

Sargent

has taken the long stroke unit from the TOP of the hole and placed it at the BOTTOM—

to operate hydraulically the time proved standard bottom hole pump!

Rod Problems and Tubing Wear eliminated

The Pump Unit can be surfaced by turning a valve

Reduces Plunger Bumping Up and Down

High Compression Ratio! This results from correct spacing of the traveling and standing valves, and the long pump stroke. It minimizes gas lock trouble in the production pump, and since the spacing is taken care of when the pump and unit are assembled in the shops, no guess work is necessary during installation or operation.

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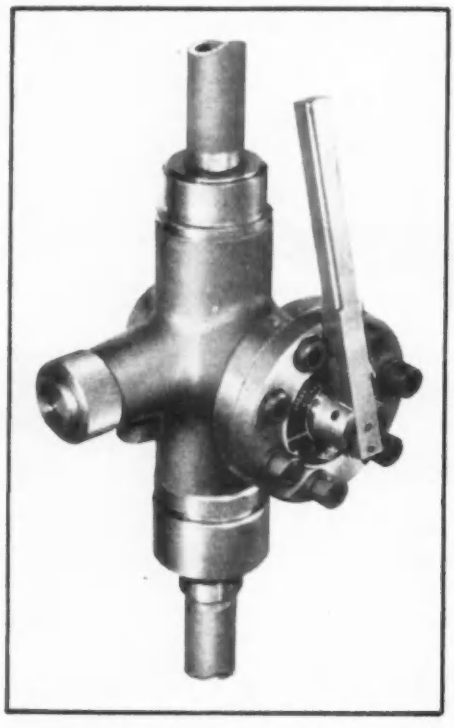
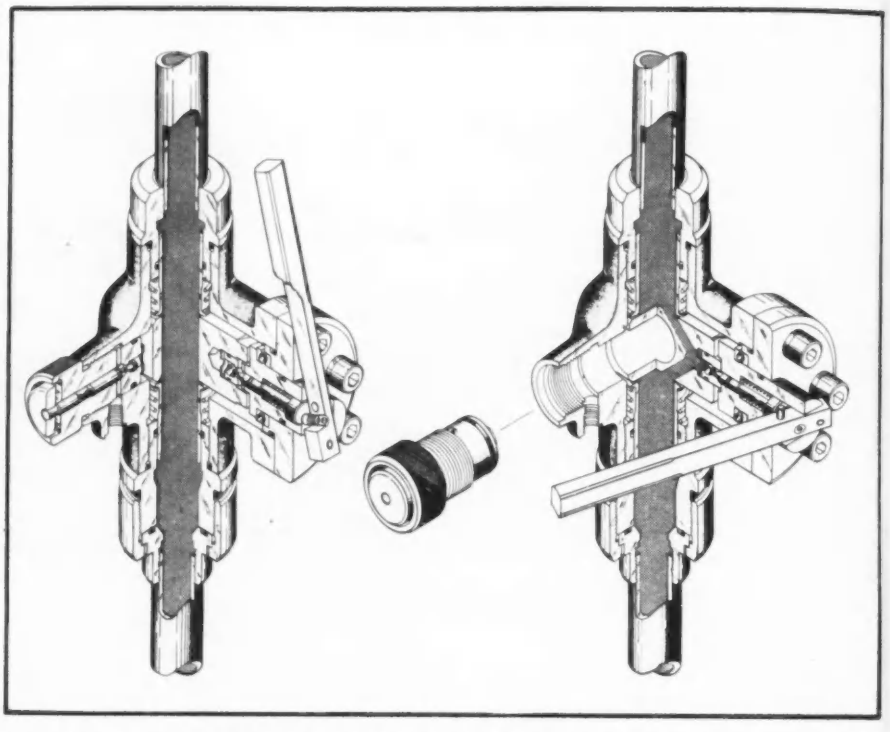


1. Photograph of new soluble plug injector with handle in operating position.



2. Section drawing through soluble plug injector showing flow in "operate" position.

3. Flow through injector when handle is in "load" position. Loading cap removed.

Unique high pressure valve permits operator to

Inject Paraffin Control Plugs Without Flow Interruption

A new valve, which has recently been perfected, permits the insertion of soluble plugs into high pressure oil lines without interrupting flow.

Where It Is Used—The principal use of the new device, called a "soluble plug injector," will be as a part of the hydraulic system of pumping oil wells.

In that system, deposition of paraffin in surface lines and in well tubing is removed by using hydraulic power to force soluble plugs through the line to scrape paraffin loose. It is normal practice to force the paraffin either to the bottom of the well in the case of tubing deposits, or to the tank in the case of surface flow lines.

To perform the operation of injecting soluble plugs it has heretofore been necessary to shut off flow and drain the line prior to inserting the plug. The new injector, however, eliminates this requirement and thereby greatly simplifies the operation.

In its present form, the new injector is applicable for injecting plugs in surface power oil lines at the central power control station. It is also used under the 4-way valve of the parallel type hydraulic Free Pump System for running soluble plugs down the production (small string) tubing.

The injector is available in 1″ and 1¼″ sizes and is designed for 5,000 psi working pressure.

How It Works—The assembly is of unique design. Within its cast steel body is a plug which is square in cross section. Through this square plug is a large diameter hole which serves as the loading chamber for the soluble plug. In the operating position, the square plug is oriented so the large hole is in line with the flow going through the injector. The square plug itself is held between two spring loaded shoes which serve to direct flow through the hole.

When the square plug is turned 90° (to "Load" position) by the external operating handle, the spring loaded shoes unseat as the plug is rotated. They ride up over the corners of the plug, and slide to a new seat on a pair of opposing faces. In this position, there is a fluid channel between the two shoes through a hole drilled in the square plug so as to bypass the loading chamber.

In the load position, the chamber in the square plug is in line with a loading cap. By bumping a bleeder valve in the cap, the line pressure within the loading chamber is relieved and the cap can be removed.

At this time, the seating shoes are hydraulically held on seat and force the line fluid to flow through the bypass channel. As soon as the soluble plug is inserted in the loading chamber and the cap replaced, the operating handle is turned back to "Operate" position. This puts the soluble plug into the flow stream which forces it down the line. Flow through the injector is continuous throughout the operation—it is never interrupted.

Availability—The soluble plug injectors are available, in any quantity. Order from the manufacturer, KOBE, INC., 3040 East Slauson Avenue, Huntington Park, California, or through any of the company's district offices.

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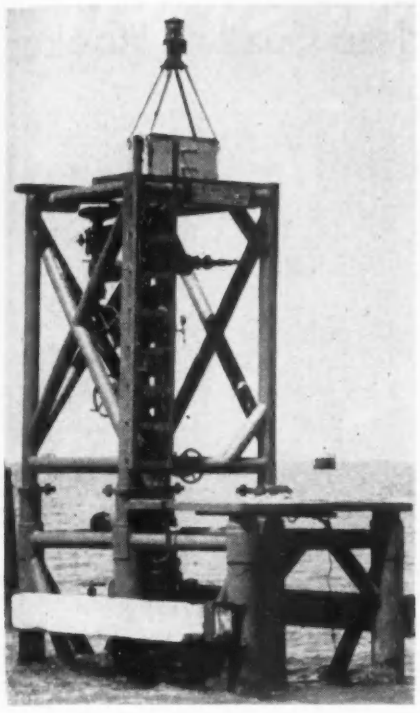
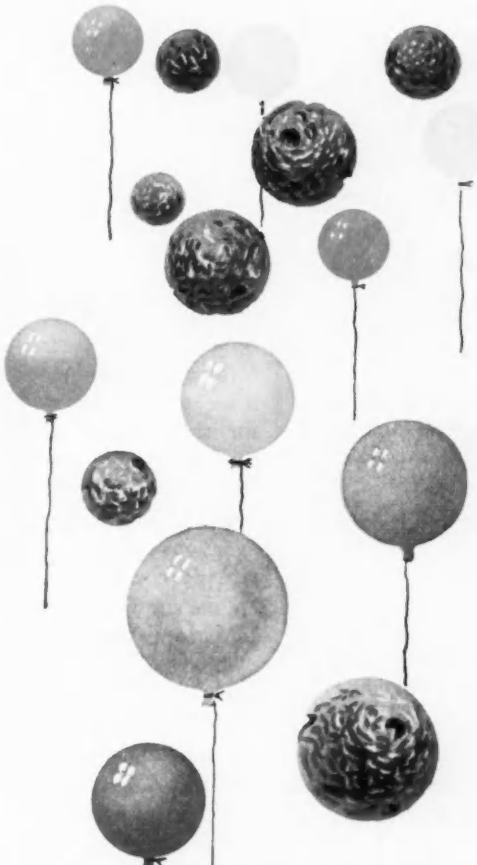


Removable Guard Frame Aids in Servicing Wells

A strong box-like guard frame protecting producing wells in navigable water was flanged in place to permit removal when servicing the well. Experience has proven the value of adequate protection against floating objects which might damage a well during high winds. In this case, the protection was carried well above the mean average water level. A well-reinforced box-like frame made of four-inch pipe and cross-braced as shown was equipped with flange connections at the bottom of all four legs.

The well was drilled by a barge rig, and the six steel pilings surrounding the well were set in place after the well was completed. This piling structure extends about four or five feet above water and remains in position throughout the life of the well. The box guard frame extends to the top of the christmas tree, and is held in place by matching flanges on the piling structure. When the well needs servicing, such as pulling tubing, or any major workover, the guard frame may be removed simply by unbolting the hold-down flanges.



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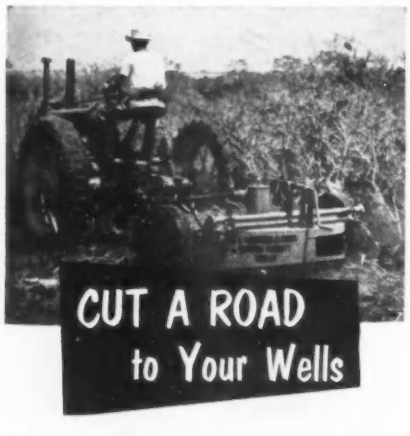

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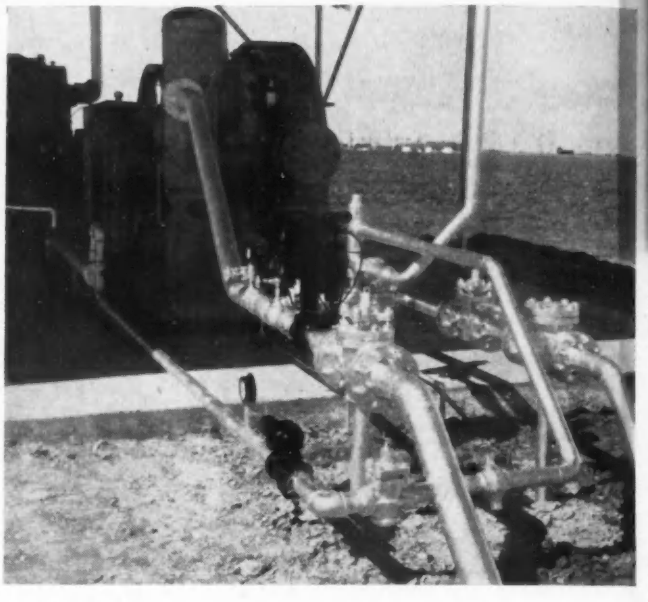
Connections Simplified on Gas Lift Hookup



Bringing all the connections into one end of an engine-driven gas compressor unit simplifies the piping layout. The single-stage gas compressor shown here is used to supply gas for gas lifting oil wells. It is powered by a gas-fueled internal combustion engine shown in the background.

The low-pressure gas comes into the compressor through a three and one-half-inch line in the center foreground. This line is equipped with a plug valve and a back-pressure regulator. At the compressor, the gas enters a scrubber before flowing into the cylinder.

Immediately downstream of the back-pressure regulator (which maintains a constant suction pressure on the compressor) is a tee connection leading to the two-inch fuel line. This fuel line is equipped with a vertical section which contains a pressure relief valve in case the back-pressure regulator fails. In this event, fuel gas would be vented to the atmosphere. Pressure on the fuel line is further reduced by a pressure-reducing regulator valve, then the gas enters a scrubber and volume tank before connecting to the engine carburetor.

Gas discharge line from the compressor is of three-inch diameter, and

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the dependable, economical water treater

CHECK THESE FEATURES:

- **Used in Oil Well Water Flooding, Municipal Water Treating Plants, Canneries, etc.**
- **Can be driven by water entering plant for treatment.**
- **Maintains pre-set water-chemical ratio through a wide rate-of-flow range.**
- **Adjustable two ways, to feed from a few pounds to several hundred pounds of chemicals per day.**
- **Also can be equipped with electric motor, or gas engine drive.**
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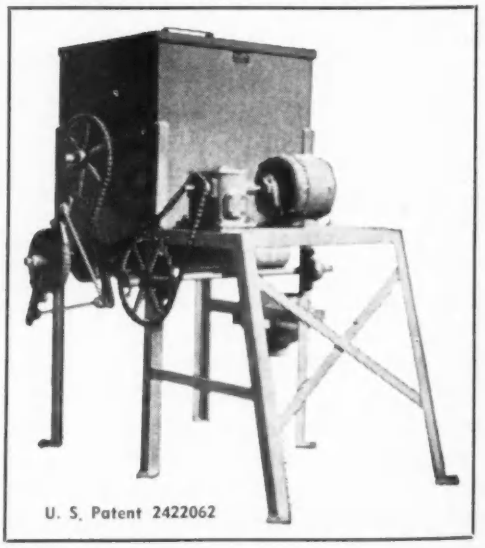
For complete description see Page 2630 of the Composite Catalog.



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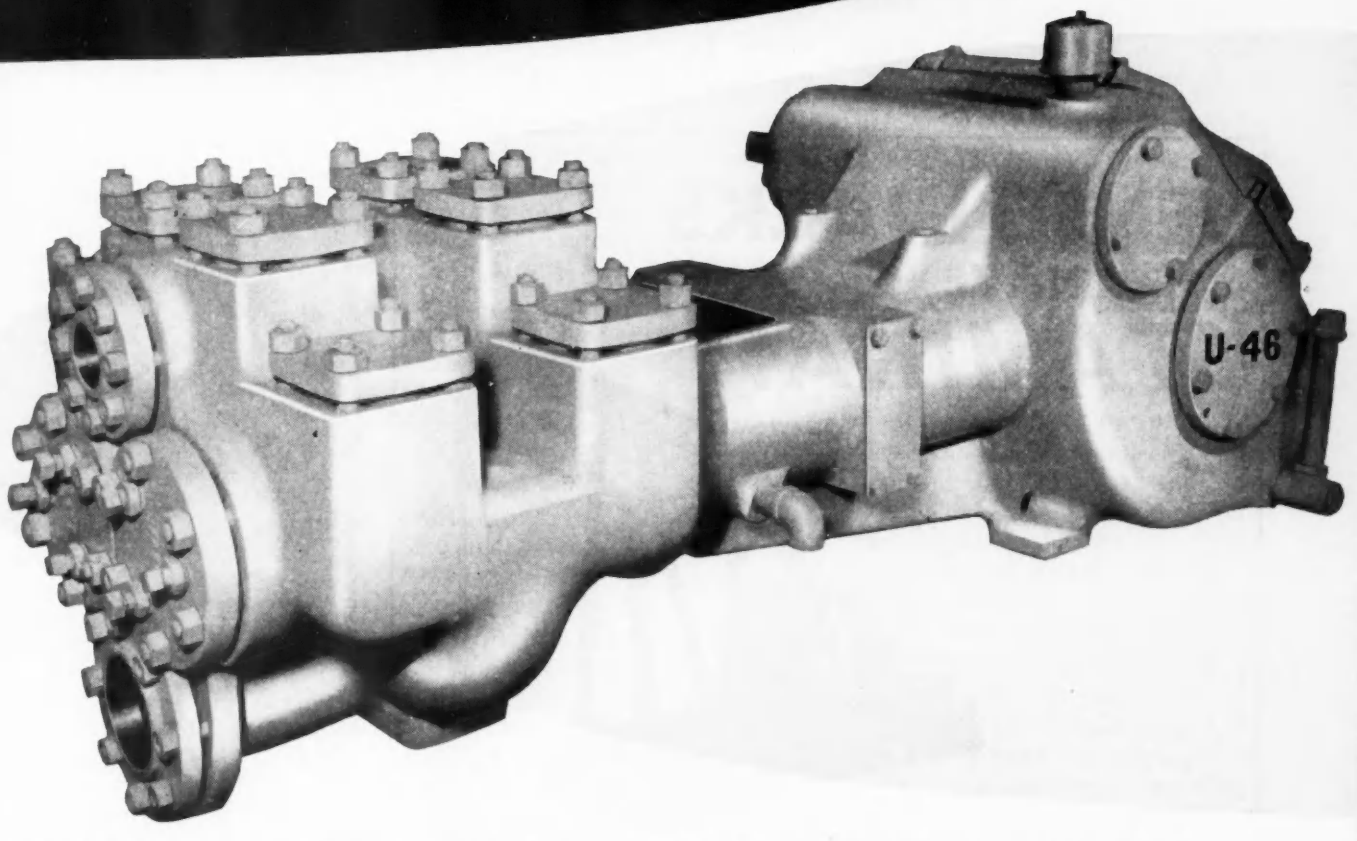

Bethlehem's U-46 is a small pump, but what a busy one! It's intended for general utility work, and we think it's the most versatile unit ever offered for this service.

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The U-46 can be used with any type of prime mover—electric motor, gas or gasoline engine, etc. For further details and specifications, check with the nearest Bethlehem Supply office or store.

In addition to drilling-rig equipment and a full range of pumping units, Bethlehem offers Beth-Co-Weld line pipe, Purple Strand wire rope, and a complete variety of sucker rods, fasteners, etc. Ask for these products when you are next equipping your oil-country installations.

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is equipped with a plug valve and a check valve downstream of the plug valve. The check valve prevents any back flow should the compressor be cut off temporarily without the valve closed.

Drilling Mud Mixture Stops Casing Leaks

A small leak in the production string of an oil or gas well near the surface can be temporarily plugged by the use of drilling mud mixtures. This "field spun" remedy consists of mixing one sack of lost circulation material, such as cellophane flakes, with two sacks of dry drilling mud, and adding enough water to make the mixture flow.

This material is injected or lubricated into the casing through existing connections, and allowed to flow down the inside of the casing. The clay in the mixture will cause it to adhere to the inside wall of the pipe, and the flake cellophane, or other suitable lost circulation material will tend to stop up the casing leak, at least temporarily until a rig is available for a workover job.

If the leak is below the fluid level, should the casing not be packed off, the mud, being heavier than oil, will carry the cellophane flakes down to the point of fluid loss. Pressure from within the casing will hold the material in place to stop the leak until such time as is convenient to go in and repair the casing leak. If the leak is suspected to be deep, it may be necessary to double the amount of ingredients suggested above.

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Blowout Preventer Loaded Last on Workover Unit

Blowout preventers cannot help much unless they're used when working over a well. This is the idea behind a loading policy of one workover contractor.

To insure that the blowout preventers are the first piece of equipment placed on the well, this item is the first piece of equipment to be unloaded from the workover unit, and the last to be loaded. Its presence in the rear of the pulling unit makes it necessary to unload the blowout preventers before anything else can be done. This should suggest to the crew that it must be installed before doing any work on the well.

In the unit illustrated, the blowout preventers remain flanged together as shown, and suspended from the cross member on the unit. Of course, the preventers are securely tied down to prevent them from flopping around and possibly striking the rear of the workover unit when moving.

Roumanian Oil Industry a Soviet Carbon

Russian-controlled petroleum business stands as an example of what happens to an economic system ruled solely on an emergency basis.

By GEORGE ROSU

THE PRICE ROUMANIA had to pay for 1953 crude production was out of proportion to the meagre results attained. Since the inception of the long-term planning, the country had been forced to make new sacrifices and concessions—beyond and above those already made during the short-term planning. Without these additional sacrifices, in finance, manpower and sovereignty, fulfillment of the objectives would have failed even worse.

Roumania is the least sovereign among the satellite states. Her entire economy has become, since 1950, part and parcel of Soviet planning. The oil sector discussed here is but one example from 14 existing joint Soviet-Roumanian corporations.

Early in 1951, Sovrompetrol was reorganized in such a manner as to be able to direct the whole petroleum industry, the object of its monopoly. The new organization is divided into 15 divisions, each dealing with a specialized sector: planning, geological search and exploration, drilling, production, processing, laboratories, transportation, supply, technology, repair workshops, administration, accounting, personnel, finance, and control.

The most important are the accounting and the control divisions. Powers of the heads of these divisions to investigate, assess the guilt, punish and issue orders are almost unlimited. Each division has a planning and control service, two activities which are inseparable in a Soviet-type of economy.

Sovrompetrol's field operations are organized into seven regional trusts, distributed geographically, according to the needs of the development groupings. In turn, each trust is divided into seven specialized sections dealing with labor norms and wage scales, production, housing and stores, assembling installations and drilling, geological survey, gas and wellhead gasoline, and prospecting activity.

The location and area assigned to each trust are:

- Trust 1 at Campina operates the most important field groups—Campina, Doftana, Bustenari, Telega, Runcu, and Tintea-Iliesti.
- Trust 2 at Moreni operates the second important set of fields—Moreni, Filipestii de Padure, Aricesti, and Floresti.
- Trust 3 at Ploesti directs field activities at Boldesti, Harsa, Ceptura, Urlati, and Berca.
- Trust 4 at Moinesti, in the Bacau district, supervises developments in central and southern parts of Moldavia—Moinesti, Tazlau, Solont, Neamtz, and Focsani.
- Trust 5 at Targoviste stretches over the densest oil fields in southern Roumania—Ocnita, Ochiuri, Gura Ocnitei, Razvad, and Bucsani.
- Trust 6 also at Targoviste directs operations in the fields situated on the Targoviste-Petrosita line—Glodeni, Doicesti, Teis, Dragomiresti, and Cazaci—as well as the newer developments in the Pitesti district—Valea Caselor, Costesti and Branet.
- Trust 7 apparently situated at Targu-Jiu conducts operations over the new—and revived—developments in the Valcea and Gorj districts—Albeni, Balteni, Pesteaua de Jii and Sacelu.

At this point, two observations can be made. First, the present organization of Roumania's oil industry is a carbon copy of the Soviet model. Second, all positions of direction and control are in Soviet hands, both in the Sovrompetrol as well as in the seven trusts.

Part 2

Roumanians are employed only in subordinate and clerical positions. Planning and important decisions are made by the Soviet delegates. Goals are subsequently sent to the ministries concerned and to the trusts for fulfillment.

The main role of the trusts is to divide the targets into tasks, duties, norms and fractions thereof, and attribute them to the trust sections, services, units, brigades and individual workers. Responsible for their fulfillment are Roumanian authorities and citizens.

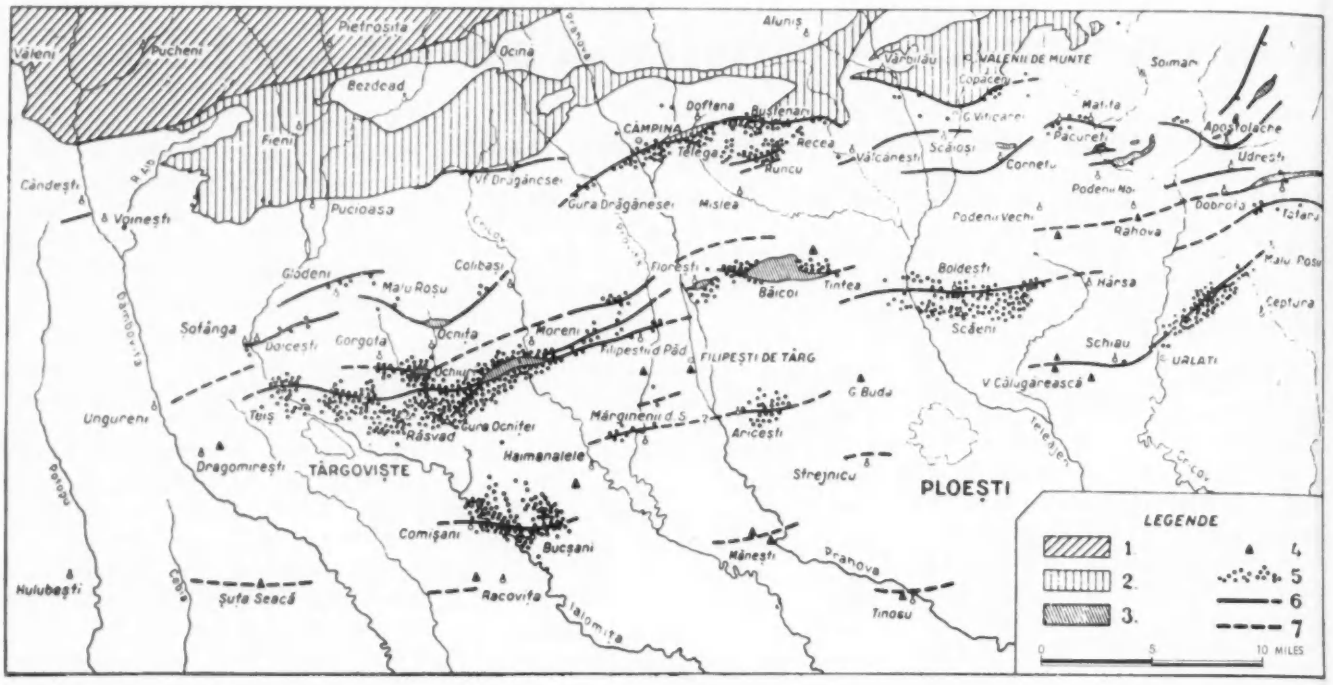
Numerous teams of controllers and agitators are sent daily into the fields to secure the norms' fulfillment. Pledges for higher achievements are exhorted from the workers and sent to the top command. They are, however, soon forgotten, and the activity drags on in daily routine.

Periodic results are collected by the Roumanian supervisors and channeled to the Planning Commission. Their reports must be sometimes dressed up or directly falsified in order to cover up incompetence and errors. The "corrected" figures are incorporated in the Plan's results announced quarterly and annually.

Inasmuch as Sovrompetrol lays down the law in every respect, its activities are not subject to the laws of the country. Nor do the laws protect Roumanian employes. Their trade unions have been transformed into agencies for the Sovrompetrol, and charged with the norms' fulfillment. The state's sovereign rights have been thus forfeited for the benefit of the joint Soviet-Roumanian corporation.

Equipment Needed. To perform the required volume of drilling, Roumania needed equipment and materials. Before the war, almost 80 percent of the equipment was imported from U. S. and Germany, while the domestic industry covered most of the needs for pipes up to 7 inch and the balance of equipment.

During the war, Germany became the main source of imports. Between 1945 and 1948, Czechoslovakia became the major supplier, and the domestic industry tried to produce equipment formerly imported. But this arrangement was thwarted by



TECTONICS OF DIAPER FOLDINGS region show present developments: 1. Internal zone of the Flysh; 2. Middle and marginal zones of Flysh; 3. Salt domes; 4. Development wells; 5. Oil fields; 6. Visible foldings; 7. Hidden foldings prospected geophysically.

Russia. Czech deliveries were diverted to Russia, domestic industry became overwhelmed with production orders for the war reparations sent to Russia.

The much advertised Soviet contribution of materials into Sovrompetrol was only words. In fact, Russia contributed into Sovrompetrol only a small fraction of what she freely collected from Roumania in 1944-1945 under the guise of war spoils. Moreover, Russia claimed—and received as war reparations—Roumania's only rolling mill producing pipes above seven inch.

For the 12.5 million feet drilled between 1947 and 1953, it was necessary from 541,310 to 570,836 tons of pipe alone, of which little came from Czechoslovakia and Russia. The domestic industry had to produce the balance. Official reports admit that much of the pipe produced at home cracked, resulting in drilling accidents and material losses.

At the end of 1947, there were in the whole industry 152 rigs of all makes and dimensions, half of which were old and overused. In the meantime, Russia may have supplied about 20 rigs mounted on trucks which can be used for depths up to 3500 feet. Also, it is claimed that she supplied 11 pieces of the much-praised turbodrills that are efficient only at shallow depths in Roumania. At the moment, the total drilling equipment may consist of about 80 deep-drilling installations in operation, 40 rigs for shallow depths plus the 11 turbodrills.

That number is much below the pre-1947 level, when only half of the present footage was drilled. To cope with the drilling tasks, each rig is used around the clock, seven days a week, by three shifts, with another team ready to perform quickly any required repair work. Even then, the results have been disappointing.

Since 1950, drilling activity has been directed according to so-called "technic-economic indexes" that aim at increasing the commercial speed per rig. Afterwards, the Russians ordered the application of a Soviet method called "rapid drilling." Newness of this "advanced" method consists in increasing the pressure on the drilling bit and in doubling the number of workers of the drilling team, the additional ones simply handing the tools and pipe to the actual drillers.

The Roumanian press quotes cases when teams demonstrating the "advanced" Soviet method had to use rigs and rotary tables 20 years old and more, drill pipe repaired many times, and pipe that had been used in several wells. These official reports are major admissions of lack of material and equipment.

In August, 1952, Russia established a new joint company, Sovrom Oil Equipment, through which to care for critical shortages. Its pattern is the same as of all Sovrom companies—make use of whatever plant capacity is available in Roumania as well as of native manpower, while Russia contributes "technical knowledge" and "managerial skill." Proceeds are evenly divided between the Soviet and Roumanian Governments. In fact, several plants were capable as early as 1938-1939 of producing a wide range of oil tools and equipment. The obstacle was of an economic nature. Fees asked for using foreign patents were prohibitively high.

Russia took the initiative of establishing the Sovrom Oil Equipment at the end of 1950 when East German experts were called to organize the planning and plant retooling. Two years later, six major plants were working as units of this joint company (though not exclusively for it). Sovrom Oil Equipment plants are numbered and located as follows:

- No. 1 at Bucharest (formerly Malaxa).
- No. 2 at Bacau (formerly Steaua Romana workshops).
- No. 3 at Ploesti (formerly Concordia plant).
- No. 4 at Targoviste.
- No. 5 at Ploesti (formerly Astra Romana plant).
- No. 6 at Resita (presently Sovrommetal).

After being retooled, Plant 1, it is

claimed, now can produce pipe up to 13 inches in diameter, derricks, turbines and special pumps. Plant 3 produces drill pipe, oil tanks, steam turbines, mud pumps, parts of processing installations, and steel cables. Plant 6 manufactures mud pumps, oil tanks, rotary drilling equipment, and diesel motors. Smaller installations and tools are produced by the other plants as well as in 14 additional enterprises.

As officially claimed, by the end of 1953, Sovrom Oil Equipment was producing 60 types of machines and tools used in drilling and processing. Inasmuch as the production of this equipment has the character of workshop manufacturing, production costs must be very high. The output is insufficient to cover domestic needs. Therefore, the official claim that such equipment is available for export must be discarded as at least premature.

Production Goal. Paramount aim of a Soviet-type of economy is production for its own sake. The production is not regarded as needing to be a well-organized and balanced process but as an emergency. It is an all-out effort whose results are seldom measured by the yardsticks prevailing in a market economy. Profit is an accidental rather than a permanent preoccupation. Losses caused by production conditions inherent in a Soviet system or by bad planning are compensated for by incomes squeezed from other sources. More frequently they accumulate from raising the labor norms and cutting the labor rewards.

This explains why labor productivity—a notion with a more complex meaning than that accepted by a market economy—is planned in advance, closely controlled, praised and much publicized. Soviet planners may refuse to rate in all instances the economic results by their degree of profit.

In the long run, however, an economic system ruled solely by emergency reasons is doomed to failure. An illustration of this is offered by the Roumanian petroleum industry.

Table 1 (World Oil, July) depicts the evolution of this industry during the last 18 years. The production-drilling scissors were closed in 1947-1948 and the two blades run parallelly since then. The parallelism is not stabilized and the trend suggests that, in the future, there will be less production for more drilling. This trend is indicative of an industry working at a loss.

The abrupt upward drifting of the drilling curve started in 1947. During the previous three years, Russians squeezed all known reserves and neglected almost completely exploration drilling because of an acute lack of materials. The small reserves saved by private companies from German exploitation were exhausted quickly.

After 1948, second class accumulations and marginal fields had to be developed. Their yield has been visibly smaller. Exploration drilling had to be greatly increased; presently, it amounts to almost a quarter of total footage drilled. Nonetheless, results are very poor when compared with efforts.

During the 1945-1947 period, when the Russians were rapidly exhausting the known reserves, the yield per drilled foot rose above the 1936 level only to drop afterwards abruptly to the lowest level ever recorded in the 20th century. The future trend is, hence, the reverse of that observed during the pre-Soviet era—the scissors are opening at the opposite end.

Financial Picture. The financial structure of the Five-Year Oil Plan is extremely complex. It springs from the strange concept of coercion and shifting of responsibilities which lies at the basis of the notion of planning. Financing of the planning is exclusively a Roumanian obligation.

In turn, the oil industry ceased to be a profitable business soon after the Russian armies occupied this country. The oil industry has been deprived of its financial means because

- The axiom that Sovrompetrol must permanently close its annual accounts with a profit. The Soviet share in this profit must be substantial, and must be paid in hard currency. These obligations result from the company's charter, bylaws and supplementing protocols. Any occasional loss is borne by the Roumanian side.
- Starting from 1945, roughly half of the Roumanian oil output went freely to Russia for the payment of war reparations. Production cost of the oil products has been paid for from the Roumanian budget. This source also provided means for covering free transportation of reparations to frontier points whence it was sent to Russia, emoluments for the Soviet supervisors, etc.

Sovrompetrol and war reparations deprived the oil industry not only of all possible profits but also of the production costs of approximately two-thirds of the actual output. Consequently, this industry had to rely for an equal amount of funds upon budgetary appropriations in order to carry out its operations. Between 1945 and 1950, total funds paid directly and indirectly into the oil industry may have amounted to between 12 and 15 percent of the total budgetary expenditure.

In 1950, even budgetary revenues were unable to cover increasing deficits. It was at this point that Russia took over the direction of the entire Roumanian petroleum industry. This occurred with the inauguration of the Five-Year Oil Plan, which continues to rely upon budgetary means for financing oil operations. As long as the Roumanian budget is the shock amortizing cushion, adverse results caused by bad planning and incompetent management are no problem. Hence, any adventure in oil operations is possible and encouraged.

Soviets draft the production plan, e.g., they fix in advance the "must-targets." They further compute working norms which, they claim, if correctly applied, will insure the targets' fulfillment and even moderate financial success.

In case of failure, the Soviet planners can easily shift the responsibility upon Roumanian shoulders by pretending that the norms have not been correctly distributed and fulfilled. The norms must, therefore, be repeatedly raised, which means that the workers must work more and more for less and less.

Drilling is performed where the Soviet representatives indicate: in fields known for their commercial deposits, in those where a chance for a strike has been discarded by competent geologists, in fields to which roads and energy sources are available.

On the average, the cost per foot drilled today is three times higher than in prewar time. The increase is caused by expensive, but low-quality, materials manufactured at home, inflation of manpower, bureaucrats and lack of technical skill.

Current production is equalling that of 1930 and of 1940. At that

time, total manpower on the payroll of the oil industry was of 26,000 and 25,000 men, respectively. Today, the total surpasses 120,000 men, e.g., it is five times higher than during the "capitalist régime." This total does not include the workers employed in oil equipment manufacturing industries, the geologic institutes and training cadres.

In the Bacau region alone are about 26,000 workers dealing with all aspects of this industry (inclusive of those employed in repair workshops). Yet, the output of this region is not higher than 5 percent of last year's total production.

UTM teams (members of the Union of Working Youth), which lack any technical training, are formed and sent wherever the targets fulfillment falters. A news item issued by the Roumanian News Agency on Jan. 16, 1953, said for example, that in 1952 not less than 35,000 such youths had been sent to join the regular brigades of Sovrompetrol Ploesti to speed up drilling operations. Of this number, 32,000 have been used in the field, and the balance went into the Sovrom Oil Equipment plant.

The news item said then that the 32,000 youths succeeded in drilling 15 wells during the first six months of their employment. This official news needs no further comment.

Distribution. Early in 1951, 129 billions lei (or $860 million at the official rate of exchange) had been earmarked as investment fund for the oil industry for duration of the planning period. This represents almost 10 percent of the entire investment fund provided for the national economy during the same period.

However, in 1952 and, again, in 1953, production and drilling plans were expanded. The investment fund must have been correspondingly raised. This fund covers only investments. Transportation, wages and salaries, the fire brigades and their equipment, training of cadres and crews, a whole series of "special services" attached to each trust and charged with screening and political indoctrination of the workers, emoluments of the numerous "agitators teams," etc., are covered from allocations budgeted either in the name of the Oil and Gas Ministry or of the local administration.

During the five-year period, Roumania's direct disbursements for the oil industry alone may be conservatively estimated at $1 billion, while the incomes are limited mainly to whatever is derived from domestic consumption. This situation compares badly with the pre-war conditions when Roumania's major source of hard currency was the export of petroleum. Not later than 1943, oil made up 56 percent of Roumania's total export. Today, Soviet propaganda tells the Roumanian people that this was the period of "capitalist exploitation and slavery."

Domestic consumption is rationed. Rations distribution depends on the decision and good will of the Soviet managers of the Sovrompetrol. Present consumption may total 12 to 13 million barrels a year, as compared with 16 to 17 million barrels annually before the war. This low level has been reached by forbidding all private motoring, by substituting oil burning with cheap lignite (Roumania has no hard coal deposits), and by squeezing private consumption. Seventy-five percent of the country's population lives in villages. Out of the existing 13,000 villages, only 480 have electric power stations. The balance depends on kerosine for lighting and household purposes. Normally, villagers would need about 5 million barrels of kerosine per year, but they are not getting more than half that amount now.

Domestic consumption is supervised through a monopolistic distribution company, owned by the Soviet and the Roumanian Governments, called Competrol. Sovrompetrol decides what quantities of liquid fuels may be distributed.

The official price for rationed kerosine varies according to the shortage of products. In 1950, the peasant paid 40 cents per gallon for rationed kerosine, and 80 cents for any additional gallon bought on the "free market" (at the official rate of exchange). Presently, prices are 80 cents and $2.52, respectively.

TABLE 3
Distribution of Roumanian Production Past Four Years
(In 1000 Barrels)

YEAR	Production	Losses and Plants' Consumption	Domestic Consumption	Balance
1950	30,225	3,022	12,000	15,203
1951	36,750	3,675	12,000	21,075
1952	38,312	3,831	12,000	22,481
1953	43,829	4,383	13,000	22,446

Gasoline is even scarcer and its price more prohibitive. Rationed gasoline cost 95 cents per gallon in 1950, including a tax of not less than 370 percent. Last year, the price was sold for $1.15 on rations. The "free market" price was much higher.

And these prices are leveled in Europe's richest oil country! Their exorbitant trends tend to discourage consumption, though the amount gathered in taxes and all kinds of fees does add to the funds required to finance the oil "planning."

Only insignificant quantities of oil products are exported by Roumania on her account, either to the satellite area or to the non-Soviet world. The balance is sent to Russia, as her share in the Sovrompetrol proceeds, as war reparations and as commercial export. The prices Russia pays for commercial exports are a state secret.

Two known elements permit, however, to infer that the same must be extremely low. The first is that the "planning" prices are those of 1950 when they have been fixed much below the international market level. The second is that Russia granted Roumania two rather substantial loans after 1948 to enable the latter to finance deficits in her trading with the Soviet.

Inasmuch as at least 80 percent of the Roumanian export goes to Russia, the great deficits of the Roumanian commercial balance are unexplainable unless the export prices paid by Russia are extremely low. Roumania's imports from Russia are much below the export levels since the former is compelled to produce, presently, at home most of the industrial equipment she formerly imported from the West.

Distribution of Roumanian production during past four years is shown in Table 3.

From the balance of 81.2 million barrels accumulated during this interval, Roumania's own exports to markets other than Russia may have amounted to 10-12 million barrels. A part of it had been exported to Western markets as Soviet oil. A comparison between the recent rise in Soviet oil exports to the free world (from 1.1 million barrels in 1950, it rose to 7 million barrels in 1953) and the quantities Roumania made available to Russia during the same interval may well explain the origin of this increase. —**The End**

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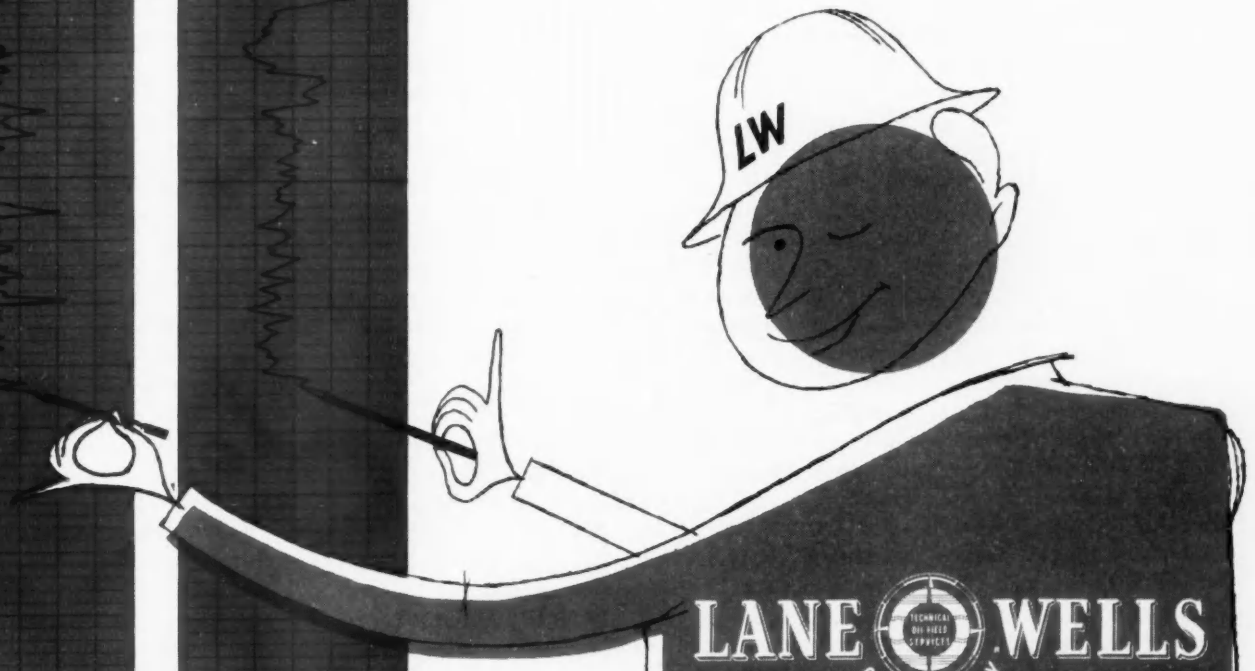

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Employes can be more accurately evaluated for future progress and training by a scientific approach to . . .

Manpower Development and Control

By A. R. TAYLOR, General Management Assistant,
Socony-Vacuum Oil Company of Venezuela, Caracas

OIL COMPANIES spend considerable time and money gathering technical information and analyzing it before they make major—or even minor—decisions on exploration and development activities. Before equipment is purchased, performance records are studied and work that the equipment is to do is analyzed. Fiscal policy and budget control are given identical treatment.

A similar approach can be adopted in planning, developing and controlling the organization and the manpower required to staff it.

Apart from public relations and humanitarian reasons for doing so, when it is considered that as much as half the annual budgets of some oil producing operations are spent on employes and that employes do the work and make many decisions that determine the economic health of a company, it is apparent that a more scientific approach to these problems would be good business.

Although Socony-Vacuum Oil Company of Venezuela was thinking along these lines, the company became acutely aware of the need for action as it undertook an increasing number of training programs. For example, in considering supervisory training, it became clear that more adequate information would be needed on the supervisor's current performance and on any plans for major changes of assignment if an effective training job were to be done.

While studying skilled labor and clerical jobs and preparing job breakdowns, Socony had to consider whether working methods were as efficient as possible and whether training objectives should be defined more carefully, possibly in terms of proficiency standards. Selection of people to be trained and developed was another concern suggesting need for personnel testing and performance appraisal.

A scientific approach. Discussions of these problems led to evolving of a Personnel Planning and Development program. Socony now is developing the associated Organization and Manpower Planning and Control project. Upon completion of the latter and combination of both, the company expects the major steps will be as shown in Figure 1.

Briefly, Socony believes many manpower problems can be solved by the scientific approach used by its technical, operating and financial people. The over-all plan will be divided into the two interdependent programs as indicated.

The plan (See Figure 1) is motivated and controlled by management. The term "management" here is used in the broad sense to include those who supervise and control various company departments and sections. It is only through discussion with these men that steps shown in Figure 1 developed.

Top management of Socony-Vacuum of Venezuela decided that rather than assign the over-all development and direction of these programs to any one department, they would undertake the job with staff members' assistance. Responsibility for putting the programs into effect is delegated to department managers and down the line as are all other major company functions.

First step in the Personnel Planning and Development program is preparation of a comprehensive personal history record by each employe so his supervisor has all biographical information needed in making decisions on the employe's current and future development. Next is a brief interpretive summary of any personnel tests given the employe.

Two appraisal tools. For jobs where concrete skills can be identified, proficiency standards are set up. These inventories mark each worker's degree of skill in relation to established proficiency standards and function as a schedule of training and development toward desired level. A chart of skill inventories for drilling crewmen is shown in Figure 2.

Two tools are used in appraising of performance of those in executive, supervisory and technical positions. The first, a more recent development in performance evaluation, is the "forced-choice" appraisal form.[1] This form was designed to overcome most faults inherent to other types of rating scales, such as rater bias and halo, the common tendency to rate too high, and thus increase the accuracy and usefulness of appraisals.

After using the "forced-choice" form, an employe is rated on a regular "graphic" type of rating scale. Here, the employe's performance is graded in relation to statements based on management's conception of the most important performance criteria. This scale, like most graphic scales, is easily manipulated by the rater, and, therefore, vulnerable to halo and bias.

There are checks on this, however:

- The factor of multiple rating, where each employe is rated on both forms by at least two persons familiar with his work.
- Comparison of "forced-choice" and graphic appraisals. If the rater is attempting a completely objective evaluation of the employe's performance, the two reports should reflect similar ratings.

The next step is very important.

Through frank discussion, an employe is made aware of the company's opinion of his performance, and foundation is laid for assisting him to do a better job. The supervisor will already have prepared in writing, on a form designed for the purpose, his views on the employe's performance and steps that he and the employe should take to correct weaknesses and better utilize strong points. During the interview, the supervisor can learn more about the employe's attitude and causes behind any of his problems.

Forward planning. Next the supervisor prepares a brief form on which is indicated the next position for which the employe might be de-

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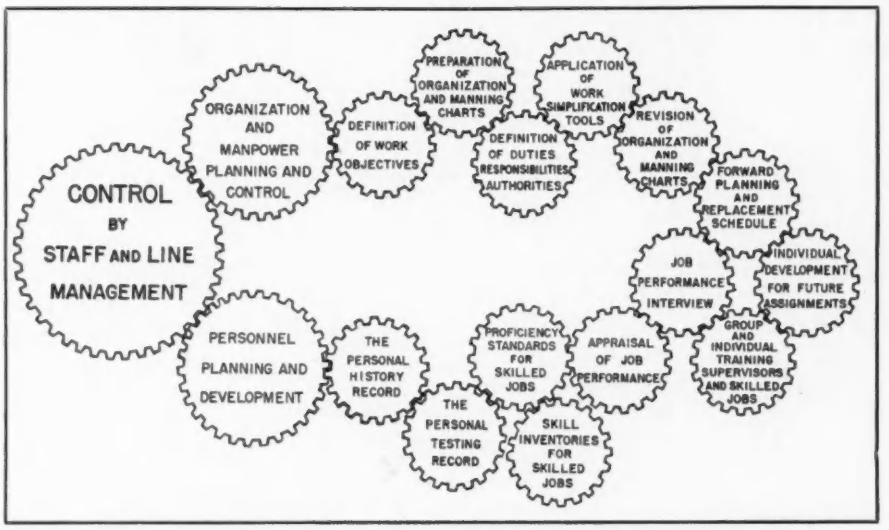

CONTROL BY STAFF AND LINE MANAGEMENT
ORGANIZATION AND MANPOWER PLANNING AND CONTROL
PREPARATION OF ORGANIZATION AND MANNING CHARTS
DEFINITION OF WORK OBJECTIVES
APPLICATION OF WORK SIMPLIFICATION TOOLS
DEFINITION OF DUTIES RESPONSIBILITIES AUTHORITIES
REVISION OF ORGANIZATION AND MANNING CHARTS
FORWARD PLANNING AND REPLACEMENT SCHEDULE
JOB PERFORMANCE INTERVIEW
INDIVIDUAL DEVELOPMENT FOR FUTURE ASSIGNMENTS
PERSONNEL PLANNING AND DEVELOPMENT
THE PERSONAL HISTORY RECORD
PROFICIENCY STANDARDS FOR SKILLED JOBS
APPRAISAL OF JOB PERFORMANCE
GROUP AND INDIVIDUAL TRAINING SUPERVISORS AND SKILLED JOBS
THE PERSONAL TESTING RECORD
SKILL INVENTORIES FOR SKILLED JOBS

Fig. 1—Two interdependent programs—Organization and Manpower Planning and Control, and Personnel Planning and Development—motivated and controlled by management.

Figure 2—Sample Form of "Skill Inventory" for Drilling Crew Personnel

1. DEVELOPMENT	Going in Hole	Floorman	(Slips, Tongs, Elevator, Spinning Chain, Stab Pipe, etc.)
2. EDUCATION		Catheadman	(Cathead, Stab Pipe, Unlatch Elevator Mud Returns)
3. BASIC OPER. PROCED.		Derrickman	(Signalling, Unrack Pipe, Latch Elevator, Stab Pipe)
4. INSPECT. & REPAIR		Driller	General (Cordination, Weight Indicator, Brake, etc.
5. GENERAL RIG LUB.			Steam (Boiler Operation, Starting Engine, etc.
6. PUMPS			Power (Torque Converter, Fluid Coupling, Starting Engine, etc.
7. GENERAL			
8. MAKING ROUND TRIPS			
9. MAKING CONNECTIONS	Pulling Out of Hole	Floorman	(Slips, Tongs, Elevators)
10. DRILLING, CORING, REAMING		Catheadman	(Filling Hole, Latch Elevator, Rack Pipe)
11. RUNNING CASING		Derrickman	(Unlatch Elevator, Rack Pipe)
12. CEMENTING, SQUEEZING		Driller	General (Cordination, Weight Indicator, D. P. Wiper, Catheading, Rotary, etc.
13. TESTING			Steam (Engine Throttle, Gear Change Clutch
14. SWABBING			Power (Torque Converter, Engine Throttle, etc.

Socony-Vacuum of Venezuela uses a "skill inventory" to show status of each skilled worker's degree of skill in relation to established proficiency standards and as a current schedule of training and development of employes toward the desired skill level. Sample shown here is taken from "skill inventory" for drilling crew and indicates some of the detailed job breakdowns required. Each of the 14 major functions required of drilling personnel are detailed in similar manner. "Skill inventory" chart used by company has block spaces to show (1) the date an employe is to start training in a particular specialty, (2) in what categories the employe needs training, and (3) degree of proficiency the employe has in each job function.

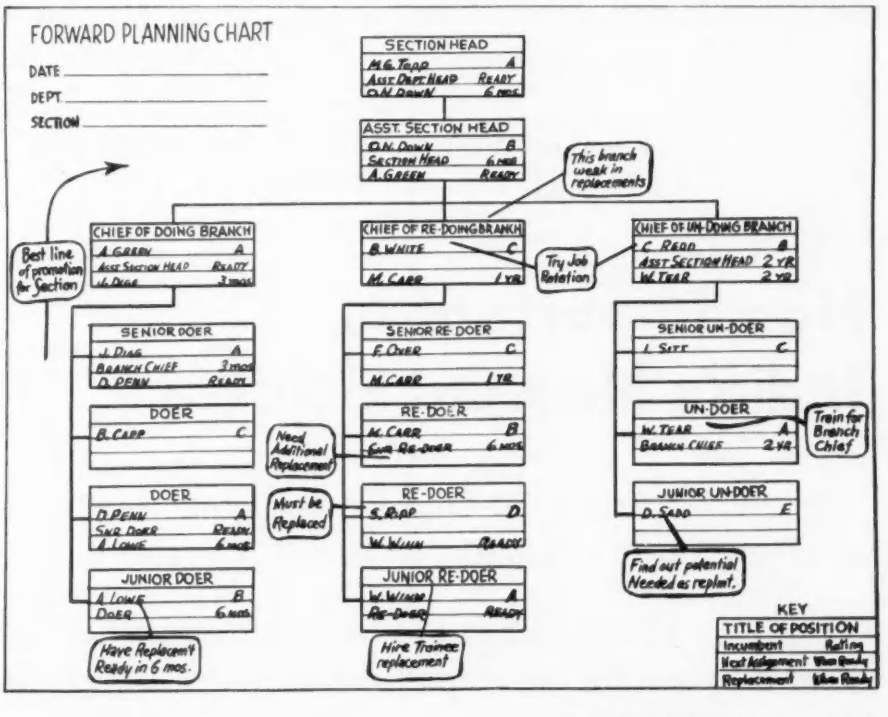


Fig. 3—A blueprint for personnel planning and development for every unit in the company is used by Socony-Vacuum of Venezuela.

NAHORKATIYA 1, Assam Oil Company, Limited, test, which discovered important oil deposits under thick alluvium in the Brahmaputra Valley in Upper Assam, is India's deepest well at 11,715 feet. Here, an AOC helicopter, used to transport men and materials for various geophysical surveys now in progress in Assam, hovers by the production derrick over the discovery well.

How Important Is India's New Oil Field?

• Assam Oil Company is sparing no effort to determine extent of India's first find in 30 years.

• Here's what has been accomplished and what the plans for the future hold.

By DON KLIEWER, WORLD OIL Staff

NAHORKATIYA, on the southern edge of the vast alluvial plain of the Brahmaputra Valley in Upper Assam, is the first discovery of a new oil field in India in 30 years, despite the drilling of many exploratory tests in the state. This new field, found by Assam Oil Company, Limited, already is proving an important addition to India's petroleum resources, and is supplementing production from the main Digboi oil field, discovered in 1889.

Recently-completed at 10,520 feet, Nahorkatiya 2, second of four wells scheduled to be drilled this year by Assam Oil to further assess the importance of the new field, has proved a commercial producer. Initial testing indicates its output is similar to that of Nahorkatiya 1, the discovery well, which is yielding a daily average of 500 barrels of 34-gravity crude.

Continued testing will determine Nahorkatiya 2's production range; however, these tests will be delayed until the planned eight-inch crude pipe line is built from the field to India's only refinery for processing indigenous crude at Digboi.

Wells 1 and 2, about a mile apart on the south bank of the Burhi Dihing river, penetrated Oligocene sandstone rocks as the crude source bed. In May AOC spudded-in Well 3. Locations for additional wells have been selected. A road through the jungle between Nahorkatiya and the main Digboi oil field, 20 miles northeast, has been built.

Production from Well 1, India's deepest well at 11,715 feet, is being refined at Digboi, and products will be distributed in India. Currently, crude is being moved by rail tank cars to AOC's refinery.

Nahorkatiya 1, which drew wide interest throughout global oil circles, found more than one sand; however, the present producing horizon is at 9847-9957 feet. Forty-one bits, including four core heads, were required to drill to the total depth. Bottom-hole pressure is about 4000 psi. Sixteen-inch casing was set at 1000 feet, 10¾-inch at 7000 feet, and 7-inch was set down to 10,000, with a 4½-inch liner.

Along with its drilling operations, Assam Oil has continued geophysical activities elsewhere in the Brahmaputra Valley. A three-way AOC geophysical survey currently is in progress as the first step in an intensive

new program of Upper Assam exploration. Particular attention is being directed to possibilities which exist beneath the thick alluvium of the Valley. Nahorkatiya discovery, on the edge of the alluvium and itself located by geophysical (gravity and seismic) surveys, opened the way for the more widespread work now under way.

India's production during 1953 amounted to approximately 2 million barrels, or a daily average of 5500 barrels, paralleling the previous year's output. Cumulative production to January 1, 1954, including the small yield from the abandoned Badapur oil field, was 52.5 million barrels.

India's domestic petroleum products requirements total about 22 million barrels annually (all products) of which the Assam oil industry produces only about 7 percent, or 1.5 million barrels, at the present time. The balance is imported, mainly from the Middle East, as refined products. New refineries on India's seaboard are being erected. They will operate on imported crude.

Assam Oil Company, Limited, photos.

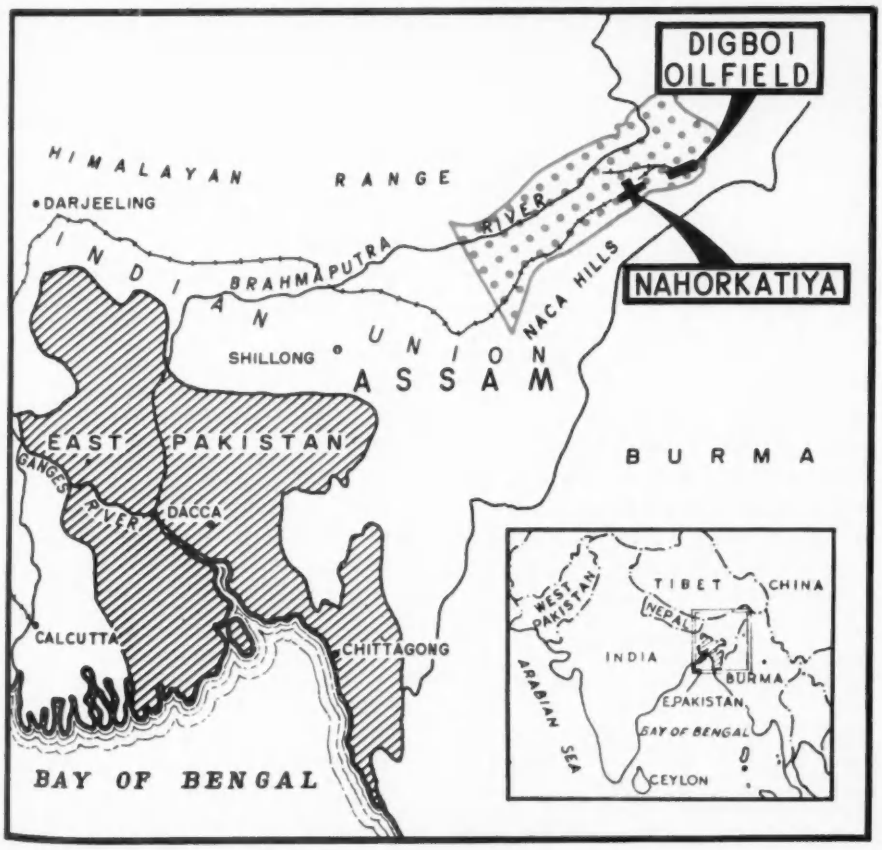
NAHORKATIYA 2 is the initial stage in development of the oil zone discovered in the Brahmaputra Valley. This well, drilled to 10,520 feet, was completed within 105 days, breaking all speed records for deep drilling operations in Asia. Like Nahorkatiya 1, the discovery well, AOC's Nahorkatiya 2 produces 500 barrels of crude daily, though additional testing is awaiting construction of a 20-mile jungle pipe line to Digboi refinery.

Nahorkatiya 1
Discovery Well Data

Total depth	11, 715 feet
Depth of producing horizon	9847-9957 feet
Placed on regular production	Feb. 6, 1954
Daily production	500 barrels
Gravity of crude	34
Bottom-hole pressure	4000 psi.
Number of bits used	41, including 4 core heads
Owner and drilling company	Assam Oil Company, Limited
Destination of crude	AOC refinery at Digboi
Method of transportation	Rail tank cars

—The End

RED AREA on map below shows Brahmaputra Valley alluvial area in Upper Assam, where India's first oil field discovery in 30 years was made by Assam Oil Company, Limited.



Continued from Page 205

veloped, the period of time required for this development, names of other employes who could replace him and when they should be ready to fill his position. Information from these individual forms is used in preparing a Forward Planning and Replacement Schedule (See Figure 3) for each organizational unit in the company.

This schedule is a blueprint of personnel planning and development for the unit. The associated individual employe files, containing all of the other forms, provide information needed for individual development.

At this point, a number of questions arise.

1. Can a realistic Forward Planning and Replacement Schedule exist without sound organizational planning?

2. Can manpower requirements be planned without analyzing what they should be?

3. Are operating methods and procedures as efficient as possible so that work is performed economically and so training effort is not wasted?

Answers led to development of the Organization and Manpower Planning and Control part of this program. This includes defining work objectives of each organizational unit. This step reduces misunderstandings and provides a foundation on which to plan the organization and manpower needed to staff it.

Next, organization and manning charts are updated and duties, responsibilities and authorities for each position are defined. In the lower echelon, current job descriptions should suffice. For key positions, an additional "organization manual" type of description is advisable.

Training needs revealed. Application of work simplification tools, such as the Work Distribution Chart, Flow Process Chart and Work Measurement Chart, help the supervisor and department manager to further analyze and establish manpower requirements. They also help maintain systems, methods and procedures at a constantly improving level of efficiency.

Since organization structures and manpower requirements may change as a result of work simplification studies or other reasons, organization and manning charts must be altered accordingly. That ties in with the Forward Planning and Replacement Schedule. This schedule, of course, must be based upon, and can be accurately superimposed upon, the Organization and Manning Chart.

Many of these steps point specifically to where training is needed. Skill inventories, performance appraisals, performance interviews, and Forward Planning and Replacement Schedules all serve as guides to supervisors in developing employes in accordance with present and future work requirements.

Supervisors can and should do much of this development work. Some training situations, however, can best be met through establishment of formal training programs. Both of these methods are used by Socony-Vacuum of Venezuela.

REFERENCE

[1] Richardson, M. W.: Forced-Choice Performance Reports, A Modern Method, *Personnel*, November, 1949.

EDITOR'S NOTE: The author in subsequent articles will discuss specific training programs for groups of employes used by Socony-Vacuum Oil Company of Venezuela, including a method of taking the training program to the job and a unique safety inspection program.

—The End

About the Author

A. R. TAYLOR has had considerable experience in the field of personnel development and employe training. He is largely responsible for the comprehensive program adopted by Socony-Vacuum Oil Company of Venezuela for manpower development. A native of Toronto, Taylor spent three years as an apprentice engineer in Canada prior to joining Trinidad Leaseholds, Ltd., in Trinidad, B.W.I. He joined Socony-Vacuum of Venezuela in 1948 as safety and training director, and was promoted to his present position as general management assistant in Caracas in 1953.

a WORLD of OIL

By DON KLIEWER,
World Oil Staff

Israel: Preparations have been made in northern Negev for another test, Masal 2, to be made. Mazal 1, a joint drilling venture by Lapidot, Israel Oil Prospectors and Jordan Exploration Companies near Sdom, was scheduled to begin drilling again with a light rotary drill replacing the percussion drill with which drilling was begun last November and which reached a depth of 1300 feet.

British Guiana: McBride Oil and Gas Corporation of Texas reportedly may receive an oil exploration concession in British Guiana which will include permission to build a refinery if oil is discovered.

Bulgaria: The government has decided to build a 2.5-million-barrel-per-year refinery at Varna to be completed in 1955. An old distillation unit will be supplied from a Batum refinery, and a catalytic cracking unit will be imported from Eastern Germany . . . An oil structure has been discovered in Svilengrad area, and the government has asked West German geologists to complete a survey of the zone.

Sicily: A cable from Palermo reports that Gulf Oil Corporation has discovered a new oil structure at Grotta d'Acqua at a depth of 7613 feet.

Italy: It has been announced in Italy that the government has sent offers to Gulf Oil Corporation under which the oil structures discovered in Sicily would be turned over to the Italian State Oil Monopoly.

Germany: Wattenheim 1, Gewerkschaft Elwerath wildcat five miles north of Worms and seven miles south of Stockstadt oil field, has reached Pechelbronn horizon at 7550 feet, with the well producing 50-60 barrels of crude daily through $\frac{2}{25}$-inch and $\frac{1}{8}$-inch chokes . . . The Wattenheim structure was found by seismic reflection . . . Drilling footage reached a new monthly record of 205,135 feet in March, 24,000 feet more than in the former record month—October, 1953 . . . West Germany's crude production for April reached a daily output of more than 49,450 barrels for the first time.

What's Happening

AMONG WORLD OIL MEN

N. B. Sauve, former chief geophysicist in Standard-Vacuum Oil Company's Exploration department at New York, has been elected a director of Vacuum Oil Company, Pty., Ltd., at Melborne, Australia. He also has been named general manager of the Frome-Broken Hill Company, Pty., Ltd., an exploration company under Vacuum's technical management.

Sauve joined Standard-Vacuum in 1934 after gaining oil exploration experience in the United States and South America. Formerly of Greenwich, Conn., Sauve moved his family to Melbourne where Frome-Broken Hill makes its headquarters.

•

Imperial Oil Ltd. has announced that two company directors, J. K. JAMIESON and TREVOR F. MOORE, have been elected vice presidents.

Jamieson attended the University of Alberta and the Massachusetts Institute of Technology. Associated with the oil industry since 1932, he became a director of Imperial Oil in 1952.

Moore graduated from the University of Toronto, has a wide experience in corporate financing, and is a former vice president of the Investment Dealers' Association of Canada. He became an Imperial director in 1950.

•

ROBERT B. WING has been appointed area exploration manager for Shell Oil Company, with headquarters in Calgary. Wing replaces H. KOCH, who has been transferred to the company's Los Angeles area.

Wing is a native of Ipswich, S. D., and was educated at Minnesota University, where he secured his B.A. degree, and at Washington University, where he received his master of science degree in geology in 1932.

After further study and teaching at Washington University, he joined Shell in October, 1934, in the Tulsa office as a field geologist and was transferred to sub-surface studies in 1935.

Following a series of sub-surface assignments in Oklahoma and North Texas, he entered the United States Army in October, 1941. He was released from service in October, 1945, after serving as a colonel on General George Patton's U. S. Third Army staff in the European theatre.

He rejoined Shell as an area geologist, and in January, 1952, was named division exploration manager at Casper, Wyo., which position he held until his present appointment.

•

J. W. THOMAS has been appointed manager of Australian exploration by West Australian Petroleum Proprietary, Ltd., an affiliate of the Caltex Group. Thomas replaces C. T. Newcomb, retiring general manager.

An employe of the California Texas Oil Company, Ltd. since mid-1948, when he was transferred from the Standard Oil Company of California, Thomas served in the New York office of Caltex as assistant manager of producing operations, Bahrain and Australia, before being assigned to Perth, in August, 1953, as assistant manager, Australian exploration.

Thomas was born in Portland, Ore., on Oct. 5, 1914. Graduated from the University of Washington in 1938 with a B.S. in geology, he joined Socal in October of the same year. Prior to his transfer to Caltex he worked as a field geologist in Arabia and California, and was geologist on drilling wells and drilling foreman at various fields in California and Washington.

When in the U. S., Thomas makes his home in White Plains, N. Y. His wife and family, two daughters and a son, are with him in Australia.

Oil Company Honors Ruler of Saudi Arabia

J. Paul Getty, president and owner of Pacific Western Oil Corporation, recently visited Saudi Arabia to inspect his company's oil operations there. His time was spent primarily in the Saudi Arabia-Kuwait Neutral Zone, where Pacific Western has an undivided one-half interest in an oil concession covering approximately 2250 square miles. During his visit to Saudi Arabia, Getty gave a large reception for His Majesty King Saud Al Saud, who recently succeeded his father as ruler of Saudi Arabia. Shown at the reception, in forefront, left to right, are James McPherson, vice president of American Independent Oil Company; Shaikh Abdulla Mubarak, director of securities in Kuwait; John Pochna, manager of Middle East operations for Pacific Western; Col. H. R. Dickson, Great Britain's representative to the Kuwait government; L. T. Jordan, general manager of the Kuwait Oil Company; Getty, King Saud, and His Highness Shaikh Abdulla Al Subah, ruler of Kuwait.

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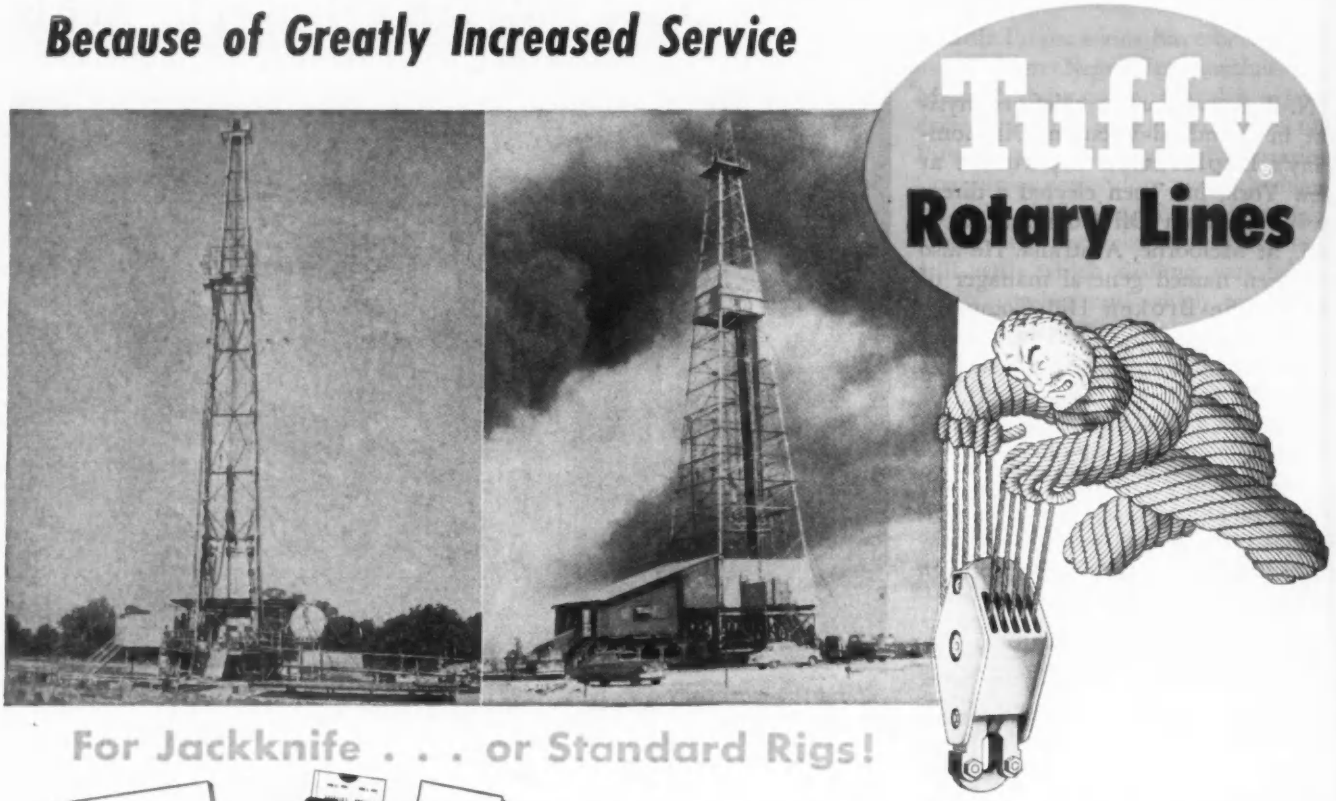

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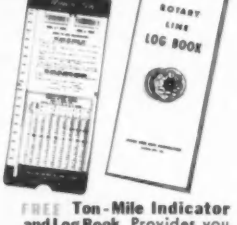

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Shell Pays $4.5 Million For Canadian Rights

Continued heavy lease and reservation buying interest in Alberta, coupled with a surprising upturn in interest in the Sturgeon Lake area 100 miles northwest of Edmonton, were revealed in the latest Alberta Government sale of oil rights. The sale brought in nearly $15 million, with Shell Oil Company taking the spotlight by paying about $4.5 million for one reservation and three half-sections near Sturgeon Lake and in a relatively new area, Swan Hills, situated about midway between Edmonton and Sturgeon Lake.

Discovered in the fall of 1952 by Amerada Petroleum Corporation, the Sturgeon Lake area, with at least five Devonian D3 producers extending in a 25-mile to 30-mile long northwest-southeast line, was given added impetus late in May with the discovery by Union Oil Company of California-Hudson's Bay Oil and Gas of D3 reef saturation in a wildcat three miles southeast of the southern end of the trend.

Government of India Proposes Oil Tankers

Shah Nawaz Khan, parliamentary secretary to the Indian transport minister, says the cabinet had under consideration a proposal regarding oil tankers for India and a decision would be reached shortly.

It was estimated that about 25 oil tankers would be required to carry the whole of India's imports of petroleum products. There is no oil tanker on the Indian registry at present. He said that the oil companies, which were setting up oil refineries in India, had their own tankers.

Discovery of Gas Near Athabasca Stirs Interest

California Standard Oil Company has made a triple zoned gas discovery in the Athabasca area of Northeastern Alberta. The discovery found gas in the Cretaceous, Basal Quartz and the D-1 structures.

California Standard September Lake 5-14 well topped the Basal Quartz at 2558 feet and tested for gas in four minutes at 1,424,000 cubic feet daily, while interval 2582 to 2591 feet

SET-UP FOR SPEED AND SAFETY

Shown above is the Kinzbach Spider with air operator attached.

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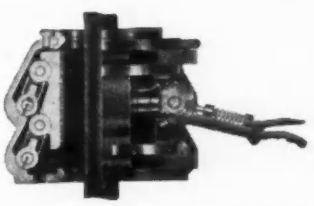
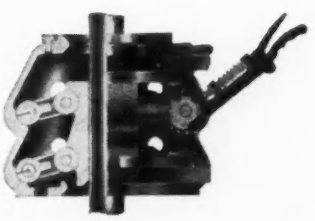


Running in. Slip segments are fully retracted.



Slip Set. Note that slip segments are still parallel with the centerline of the pipe. Handle is locked in "closed" position.

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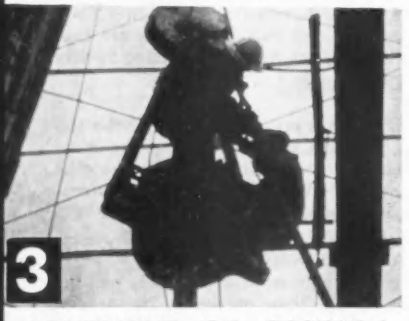

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yielded gas in ten minutes at 1.2 million cubic feet daily.

The D-1 formation was topped at 2581 feet and test of 2591 to 2604 feet gave gas at 2 million cubic feet daily and interval 2604 to 2614 feet flowed gas in three minutes at 1,173,000 cubic feet daily.

This California Standard well is located about 22 miles northwest of Athabasca.

SMOA Steps Up Drilling Program in Austria Zone

Exploratory tests are being drilled in the outskirts of Vienna, and the Soviet Mineral Oil Authority, which controls Austria's East Zone oil operations, has built a derrick inside the city limits within the past month. The rig inside the city was built near the Floridsdorf Gas Works.

This move appears to be a Soviet effort to offset reduced production of oil from already-existing Austrian fields.

In addition, six other derricks are located inside the city limits, between Kagran and Breitenlee. Near Hirschstetten, an exploratory test is under way, and late reports say SMOA has rigs operating in Fischamend, south of the Danube and in the foothills of the Leitha mountains, and near Baden, about 40 miles south of Vienna.

Mexico Will Improve Its Oil Shipping Facilities

Improved oil shipping facilities for Mexico are planned as part of the government's program of port reconstruction, publicized in the country as "The March to the Sea."

Plans call for initial spending of $1.9 million in modernizing seven Gulf of Mexico ports and nine Pacific Coast ports.

In addition to improving port conditions for oil shipping, Pemex, the government owned oil industry, announced plans for purchase of four new tankers. The additions to the fleet, scheduled for next year, include two 16,000-ton vessels and two of 3500-ton capacity.

Tuxpan, an oil port 100 miles south of Tampico, is scheduled for special attention. A narrow gauge railroad now operated by Pemex in the Tuxpan area will be turned over to the Naval Ministry for use in enlarging the port.

Saskatchewan Initiates First Allowable Regulations

Saskatchewan placed into effect the first regulations governing production allowables of oil wells within the province. In announcing the new order, effective January 31, Hon. J. H. Brockelbank, minister of Mineral Resources of the province, said the regulations were necessary to ensure to the greatest possible degree the maximum recoverage of oil from the province's oil reservoirs.

Under the new law, no oil shall be produced from any well completed as a producing well before or after the effective date of the regulations until a maximum production rate has been established and notice of the production allowable is made by the Department of Mineral Resources. Oil produced in initial production tests will be the only production to be allowed from a well prior to establishment of the legal allowable.

The operator of a newly-completed well, on application to the Department of Mineral Resources, on a form supplied by that department, will, within 14 days receive notification of his maximum production allowable. Regulations include the provision that maximum production from a well on any one day shall not be more than 25 percent in excess of the production allowable.

In cases where the maximum permissive rate in any month has been exceeded by more than two percent, the rate for the following month shall be reduced by the same amount. However, should the production for a given month amount to less than the maximum allowable, the operator will not be allowed to exceed the maximum permissive rate on the following month to make up the lost production.

Upon application of the operator and recommendation of the Department of Mineral Resources, the maximum production allowable may be varied from time to time.

The new regulations, set up under the Oil and Gas Conservation Act, are printed in the December 19, 1953, issue of the Saskatchewan *Gazette* (Volume 49, Number 51).

What's Happening

AMONG MEN IN THE INDUSTRY

W. N. Finnegan, executive assistant at **Humble Oil & Refining Company,** has retired from active service with the company for reasons of health. Finnegan, who requested retirement after having been on a year's leave of absence, has been in the oil business for more than 30 years. Upon retirement he plans to devote full time to business activities of his own. Finnegan had served for some years as chairman of the public relations committee for Humble and has been vice chairman and a member of the executive committee of the Oil Industry Information Committee.

W. N. Finnegan

•

Joseph W. Meehan, division head in Chicago headquarters for **The Pure Oil Company,** has been elected president of **Pure Transportation Company,** wholly-owned subsidiary of The Pure Oil Company. He will continue to be located in Chicago. Meehan will also continue to serve as general manager of pipe lines and the Crude Oil Purchasing division of Pure Oil.

•

Sterling Oil of Oklahoma recently elected five new members to the board of directors. They are **Franklin E. Bernsen,** Tulsa; **Arthur G. Bisgood,** New York; **Albert F. Donohue,** New York; **Albert Barnes Zink,** Philadelphia; and **Frank Zugelter,** Cincinnati. Reelected as directors are **Jesse A. True,** president; **Sterling P. True,** vice president and treasurer; and **Joe H. Dawson,** secretary.

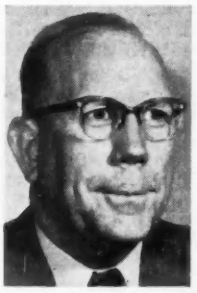
•

Walter A. Sloan of Oakland, Calif., regional treasurer of **Tide Water Associated Oil Company,** retired recently after 52 years of continuous service. Sloan started with Associated Oil Company, a predecessor company of Tide Water, as a clerk in the Accounting department at Bakersfield, Calif. Sloan was the first person to complete 50 years of service with Tide Water's Western divsion.

•

William H. Thomas has been named chief scout for **Shell Oil Company** to succeed E. L. McDowd, who retired June 30 after 21 years service with the company. Thomas has more than 21 years of service with Shell. He began his career in the company's Exploration department as a laboratory assistant. Later he was assigned to oil scouting, then promoted to division scout. As chief scout, Thomas will have offices in Los Angeles.

G. B. Kitchel



A. T. F. Seale

J. C. Finley

J. J. Kelly

Kerr-McGee Oil Industries has announced the appointment of four new vice presidents and two new managers. **G. B. Kitchel** has been elected vice president—Gulf Coast operations; **A. T. F. Seale** named vice president—manufacturing and general engineering; **J. C. Finley,** vice president—exploration; and **J. J. Kelly,** vice president—sales. Two other promotions announced were **J. W. Roach** to manager of operations, Manufacturing department; and **W. H. Dean** promoted to manager of Drilling department.

•

Bryan S. Reid, general manager of the Chicago division of **Socony-Vacuum Oil Company, Inc.** has retired after 43 years in the oil industry. He organized the Inter Ocean Sales Corporation and served as president until the company was sold to the Wadhams Oil Company, when he became assistant to the president. Wadhams became part of the Socony-Vacuum organization and in 1932 Reid was named general manager of the Chicago division.

•

Samuel T. Coleman has opened an office as oil operator and lease broker in Tulsa. Since May, 1951, Coleman has been with **Deep Rock Oil Corporation,** heading the company's Land department and later as assistant manager of exploration. He was with The Carter Oil Company for 13 years before joining Deep Rock. While with Carter, Coleman's work included land operations in the Illinois Basin and in the Mid-Continent and Rocky Mountain areas.

H. F. (Red) Hopkins has announced the opening of a petroleum consulting engineering office at 2212 Niels Esperson Building in Houston. Hopkins will specialize in problems of drilling, completion and workover of oil and gas wells with special emphasis on primary and remedial cementing techniques. After receiving his geological engineering degree from Texas Technological College, Hopkins was employed by Overton Refining Company in the East Texas, North Central Texas and North Louisiana areas. He joined Halliburton Oil Well Cementing in Corpus Christi in 1938. After spending some time in the service, Hopkins returned to Halliburton as division engineer, transferred to Houston in the same capacity, and was promoted to assistant division manager and division engineer of the Gulf Coast Division in 1952. Hopkins joined the Newton-Conroe and Newton-Phoenix Oil Corporations as superintendent, Western Division, in Abilene, Texas, in 1953.

H. F. Hopkins

•

Sunray Oil Corporation has announced the election of the following 13 directors to serve for the ensuing year: **L. W. Bennett, J. K. Ellis, W. D. Forster, D. L. Frawley, Edward Howell, F. B. Parriott, Alfred L. Rose, J. L. Shakely, A. A. Seeligson, Glenn J. Smith, Paul E. Taliaferro, W. C. Whaley** and **C. H. Wright.** Officers relected include **C. H. Wright,** chairman and chief executive officer; **F. B. Parriott,** chairman of executive committee; **W. C. Whaley,** president; **Paul E. Taliaferro,** executive vice president; **Edward Howell,** vice president and general counsel; **H. O. Harder,** vice president and manager of exploration; **R. E. Foss,** vice president and manager of production; **J. B. Smith,** vice president—manager of sales; **M. Darwin Kirk,** vice president and general attorney; **W. D. Forster,** secretary—assistant treasurer; **L. W. Bennett,** treasurer—assistant secretary; and **Walter J. Philp,** auditor.

•

The Ohio Oil Company has announced the promotion of **J. L. (Jimmy) Boller, Jr.,** from scout to landman in the San Antonio district. Boller will remain in San Antonio. **Harold Broome** of San Angelo has been named to succeed Boller.

•

R. W. Norton has been appointed field superintendent, Newhall-Ventura, Santa Maria areas, southern district of **Standard Oil Company of California.** His successor as field superintendent will be **G. C. Beckman,** who will maintain headquarters at Rio Vista. A third new appointee, **Kistler Wagy,** was named assistant to management, San Francisco office.

Mid-Continent Petroleum Corporation has elected a new treasurer and assistant secretary, **R. Paul Henry**, succeeding **Charles Klein**. Reelected officers include **Jacob France**, chairman of the board; **R. W. McDowell**, president; **Richard H. Wills**, vice president and general counsel; **Albert E. Pierce**, vice president — production; **T. E. Fitzgerald**, vice president—sales; **G. E. Wynn**, vice president — manufacturing; **E. M. Rouzer**, vice president and secretary; **R. H. Brady**, assistant secretary and assistant treasurer; **G. O. Tipton**, controller; and **D. Glenn Morgan**, director of research and development. **Charles Klein** was elected assistant secretary and treasurer to serve until his retirement. Klein has been with Mid-Continent since Jan. 15, 1919. Henry joined the D-X organization as tax counsel in 1949. He worked as a public accountant before entering law school. Henry served as assistant district attorney of Dallas County (Texas) and practiced law in Dallas before entering military service. Before joining Mid-Continent, he was an attorney in the Office of the Chief Counsel, Bureau of Internal Revenue.

R. Paul Henry

•

Millard E. Stone, director of industrial relations for **Sinclair Oil Corporation** and subsidiaries, has been elected a vice president of the parent company. Stone came to Sinclair in 1952 from Bendix Aviation Corporation, South Bend, Ind., where he had been director of industrial relations of the Bendix Products Division. Stone served on the War Labor Board during World War II and was chairman of the industry members of the Wage Stabilization Board in Washington during the post-war period.

•

W. O. Ham, Jr., regional geologist for **Continental Oil Company**, has been promoted to assistant general manager of Conoco's southwestern region headquartered in Fort Worth. Ham succeeds **H. S. Skinner**, recently promoted to administrative assistant to the president with headquarters in Houston. Ham has been associated with Conoco's geological activities for the past 11 years. He was promoted to regional geologist for Conoco's southwestern region in 1952.

•

H. O. Cameron, Toledo, Ohio, has been appointed assistant to **Sun Oil Company's** vice president—production. Cameron has been manager of the company's Michigan Production division. **George W. Myers**, formerly assistant division manager, now becomes manager and **F. H. Latimer** assistant manager. Cameron, active in petroleum circles in Toledo, is president of Bay Terminal Railroad. Myers, first employed by Sun in 1917 as a geologist and landman in Ohio, became chief geologist of the Michigan division and later assistant manager. Latimer started working for Sun in 1938 as a geologist in Evansville, Ind. He was transferred to the geological staff in Philadelphia in 1947 and since 1951 has been assisting Myers in Toledo.

J. E. Gallagher has been named chief mechanical engineer for **Shell Oil Company's** Pacific Coast exploration and production area succeeding the late **C. A. Yeatman.** Gallagher, a graduate of Stanford University, started his career with Shell during school vacations as a laborer and roustabout in the Ventura field. He joined Shell in 1944 and moved to San Francisco where he worked as technical assistant. A year later he transferred to Bakersfield where he served as exploitation engineer and later as senior mechanical engineer. In 1948 he moved to Casper, Wyo., where he worked on the early development of Shell's activities in the Rocky Mountains. Returning to Bakersfield in 1950 he was named division mechanical engineer. In 1951 he was appointed division production superintendent, a position he has held in both Bakersfield and Ventura until his appointment in Los Angeles.

•

Emmett D. Whitis has joined the **Ada Oil Company** at the firm's Houston office as chief engineer of the Reservoir section, Production division. Whitis was formerly petroleum and reservoir engineer with Stanolind Oil Company and the Texas Eastern Production Corporation of Houston. He received his B.S. degree in petroleum engineering from the University of Oklahoma and is a member of the American Institute of Mining and Metallurgical Engineers.

•

Von Osinski, another addition to the expanding Production division of the **Ada Oil Company**, has been assigned to the Midland, Texas, office as a geologist. He attended Indiana University and did graduate work at the University of Colorado. Osinski has had 13 years of experience in the West Texas-New Mexico area as subsurface geologist and geophysicist. He previously was with Skelly Oil Company, Honolulu Oil Corporation, and Klaus Exploration Company.

•

John R. Cox, district geologist in Kansas for **Midstates Oil Corporation**, has resigned to become a consultant at Wichita, Kan. Cox was assistant district geologist for The Texas Company before going with Midstates.

•

John G. McLean, authority on industrial organization and professor of business administration at Harvard University, will serve as an assistant to the president of **Continental Oil Company** while on leave of absence from Harvard. McLean, who has been associated with Harvard's graduate school of business administration since 1940, has for the past seven years taught advanced courses dealing with the organization of industries and the impact of changes made by technologies and competition of management policies. During his association with Conoco, McLean will conduct special studies concerning the company's programs, policies and procedures. He will make his headquarters in Houston. McLean is co-author with Robert William Haigh of a recent book, "The Growth of Integrated Oil Companies."

John G. McLean

Emery V. Squires, assistant director of purchases of **Richfield Oil Corporation**, has been appointed director of purchases succeeding **Herbert H. Kelly**, who retired June 30. Squires has been active in purchasing operations for 30 years, having joined Pan-American Petroleum Company, which was later acquired by Richfield, as a stock record clerk in 1924. He became a buyer in the former Richfield Oil Company general office in 1933 and later was assigned to direct the company's central division purchasing office. He became a buyer in the Los Angeles office in 1937 and was named assistant director of purchases in 1949.

Emery V. Squires

•

Lester C. Uren, professor of petroleum engineering at the University of California, has retired after 42 years of teaching service. Professor Uren organized the University's first petroleum engineering curriculum in 1915 and developed petroleum engineering courses that have become a pattern for similar programs in other collegiate institutions. He is the author of several books and many professional papers and trade journal articles on various phases of petroleum production technology. Uren plans to continue his professional and journalistic activities.

•

J. D. Novotny has been named field seismograph supervisor for **Stanolind Oil and Gas Company's** Lubbock district where he will supervise seismic operations.

Novotny, after graduating in 1948 from the Missouri School of Mines with a B.S. degree in mining geology, joined Stanolind as a junior computer with a seismograph party. Since that time he has performed various seismograph functions both in a staff and a supervisory capacity.

Novotny replaces **P. H. Garrison** who was transferred to Stanolind's Oklahoma City division office as division geophysical supervisor.

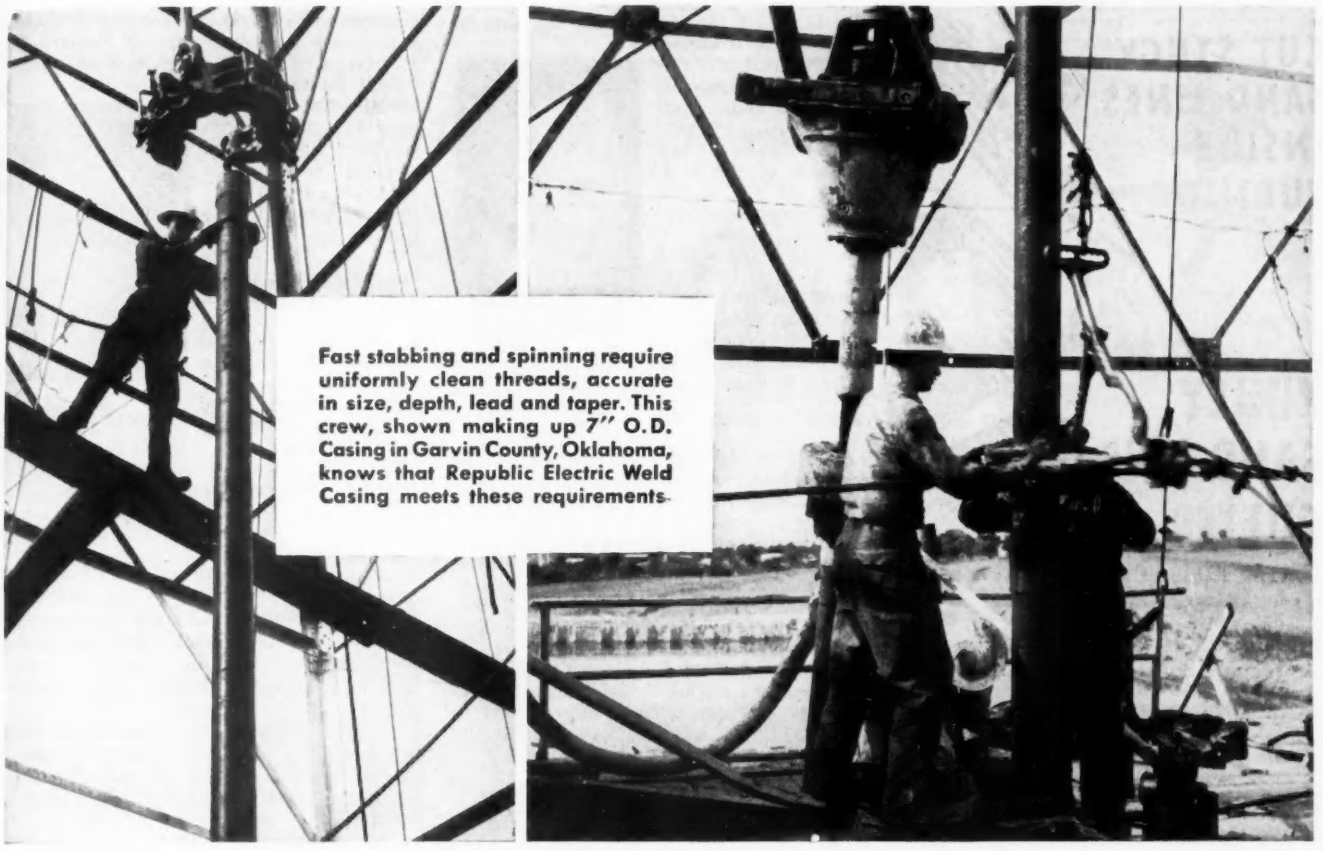
•

Felix Chappellet, former **General Petroleum Corporation** executive, has been officially appointed as the permanent general manager of the **Western Oil and Gas Association.**

Chappellet, who resigned from the position at General Petroleum after 30 years with the corporation, has served as acting head of the Association since November 24 last year. He replaced **John M. Peirce**, who was appointed by Governor Knight as California's director of finance.

Chappellet's oil industry experience includes work in land, production and marketing operations. A leading member of state and local chamber of commerce highway bodies and other civic road improvement groups, he is recognized as an expert on modern highway development and finance.

Chappellet is on the board of directors of the California Highway Users Conference, on the executive committee and a director of the Downtown Business Mens Association, director and vice president of the American Library of Information, and a member of the Advisory Council of the University of California Institute of Traffic and Transportation Engineering.



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Ted G. Ward, Jr., has joined the firm of **Buckles and Hostetler Oil Production Consultants** in Monahans, Texas, as chief engineer. Ward is a petroleum engineering graduate of the University of Oklahoma. For the past several years he has been specializing in water flooding in West Texas, having been associated with Atlantic, Reno, British-American and Richardson & Bass.

Ted G. Ward, Jr.

•

John R. McMillan has been elected president of **Fullerton Oil Company** to succeed **W. W. Valentine**, who resigned following the sale by the Valentine group of its interest in the company. McMillan began his career with Barnsdall Oil Company as draftsman while attending college and subsequently served some 14 years with that firm in responsible positions in the Production and Exploration departments. He joined the staff of Fullerton Oil in 1943 as petroleum engineer and assistant manager of field operations and some four years later was named vice president and director—production and exploration.

•

Lon D. Cartwright, Jr., manager of exploration for the eastern area of **Union Oil Company**, has resigned his position to become vice president of **Cyprus Mines Corporation** and **Cyprus Oil Company**. Cartwright joined Union in 1939 in Houston and was in charge of the company's exploration on the Gulf Coast until 1949. Subsequently he was transferred to Los Angeles and became chief geologist. Two years ago he was made manager of exploration for the eastern area. He was responsible for exploratory work for Union in Texas, Louisiana, New Mexico, Oklahoma, Williston Basin and all other parts of the U. S. not assigned to organized divisions. Cartwright will be in charge of oil operations for Cyprus.

•

L. W. Goudy has been appointed district geologist for **Stanolind Oil and Gas Company's** Kansas exploration district. Goudy replaces **C. R. Barr**, who has transferred to Stanolind's new district office at Denver.

•

C. F. Stephenson, assistant division superintendent of **Magnolia Petroleum Company's** Oklahoma Division, has been promoted to division production superintendent. He succeeds **A. H. Proctor**, who has retired from active duty after 40 years service.

•

Frank H. Purcell and **J. A. Mull** have formed a new Kansas drilling company at Wichita. The **Purcell-Mull Drilling Company, Inc.**, has established offices at 6427 E. Kellogg Street. Purcell has been an independent oil operator and Mull was formerly executive vice president of Central Exploration Company.

•

Charles Wolfe, Ray L. Urban, and **Clara Wolfe**, all of Dallas, have formed the **Rainbow Drilling Company.**

California Texas Oil Company, Ltd. has announced the retirement of **Howard M. Herron** as chairman of the executive committee of the Caltex group of companies after 44 years of service. Herron was named the first president of the Caltex group when the organization was formed in 1936. In February, 1946 he became chairman of the board of directors of the Caltex group and in January, 1950 was appointed chairman of the executive committee. Herron joined The Texas Company in 1910, serving in various positions including assistant manager and later manager of the Export department.

Howard M. Herron

•

D. Ray Langford has been named assistant division purchasing agent for **Sun Oil Company's** Southwest Division.

Langford will assist the purchasing agent, **H. R. Adair**, in directing the purchasing operations of Sun's Southwest division.

Langford has been a buyer for the company since May 16, 1949. He is a member of the Purchasing Agents Association of Dallas, and has served as head of a number of its committees.

He first joined Sun in 1946 as field clerk-warehouseman at Sun Field, Starr County, Texas. He was warehouse supervisor at the time of his move to the Purchasing department in Dallas.

Langford is a native of Nocona, Texas. He received his bachelor of business administration degree from North Texas State College, Denton, in January, 1944. During World War II, he served in the U. S. Navy's amphibious forces, and was in the Pacific theater for a year.

•

E. L. Maxwell, manager of **Lion Oil Company's** production and exploration activities in the Central Region, has announced recent promotions of personnel within the region.

Kenneth E. D. Lane, a native of Greeneville Tenn., has been promoted to district landman for the Kansas district with headquarters in Wichita.

C. Elton Gore was recently promoted to district geologist for the Kansas district and also has his office at Wichita.

John H. Gatchell has been promoted to district geologist for Oklahoma with headquarters in Lion's Oklahoma City office.

•

Directors of **Gulf Oil Corporation** have designated **David Proctor** as executive vice president of the corporation. Proctor has been a director, vice president and general counsel for Gulf since 1945 and is a member of its top policy making committees including the executive, finance and management policy committee.

•

Earl Bruno, formerly with Western Natural Gas Company as chief drilling engineer, has resigned to become production superintendent of **Ada Oil Company** at Midland, Texas.

DEATHS

Edmond L. Lorehn, 59, executive vice president and one of the original incorporators of Cameron Iron Works, died July 13 in Houston. Lorehn had been with Cameron Iron Works for 34 years, starting his career as a roughneck in the oil fields. He was hired by Jim Abercrombie as a toolpusher and later named secretary-treasurer of Cameron. He became vice president and general manager and in 1951 was named executive vice president.

Edmond L. Lorehn

•

Harold R. Pauley, 44, prominent oil man of the Pacific Coast area, died May 7 in California. He was associated with his brother, Edwin Pauley, in the oil business most of his life and formerly was president of the Petrol Corporation. At the time of his death Pauley was president of Stancal Asphalt and Bitumuls Company. He was a partner in the ownership of the Los Angeles Rams professional football team and of Cocoanut Island, Oahu, in the Hawaiian Islands. A native of Alabama, Pauley attended school in California and was graduated from Stanford University.

Harold R. Pauley

•

F. Weldon Brigance, 56, executive vice president of Rowan Drilling Company, Inc. and a former president of the American Association of Oil Well Drilling Contractors, died July 2 in Fort Worth. During his career with Rowan, he served as treasurer, vice president—operations, vice president and general manager before becoming executive vice president. He was also a director of the American Petroleum Institute.

•

John G. Pew, 83, a director of Sun Oil Company and former president of Sun Shipbuilding & Dry Dock Company, died July 1 in Rose Valley, Penn. Besides his long years of service in the shipbuilding industry, Pew had been in the natural gas industry, having served as president of the Peoples Natural Gas Company and of Hope Natural Gas Company before joining Sun.

•

Francis David (Frank) Bovaird, 67, executive vice president of the Bovaird Supply Company and widely known in the oil and supply industry, died June 18. Bovaird was a member of the third generation in the Bovaird family who first entered the oil field supply business in 1871.

•

Mrs. Maud Adams Mosier, 89, principal stockholder in The Petroleum Company of Los Angeles, died May 27 in Los Angeles. She was the widow of the late Martin Henry Mosier, pioneer oil developer who had holdings in the Southland and other oil-rich areas of the nation.

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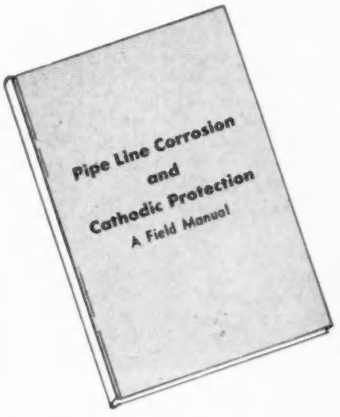

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What's Happening

AMONG INDUSTRY ASSOCIATIONS

Eastern District API Officers Named

Officers pictured at the spring meeting of the Eastern District of the American Petroleum Institute, Division of Production, are, left to right, front row: R. L. Bird, Jr., Columbian Carbon Company, Charleston, W. Va., retiring chairman who was named chairman of the district advisory committee; Paul G. Benedum, Hiawatha Oil Company, Pittsburgh, chairman; Harry M. Brown, Chartiers Oil Company, Pittsburgh, secretary-treasurer; and James M. Bird, Bird Well Surveys, Bradford, Penn., one of the district vice chairmen. In the back row are all newly-elected district vice chairmen. Left to right are Fred C. Newman, Oil National Bank, Evansville, Ind.; J. Robert Hornor, Delaware Gas Company, Clarksburg, W. Va.; Lysle R. Kirk, The Ohio Fuel Gas Company, Columbus, Ohio; and Richard J. Murdy, New York State Natural Gas Company, Pittsburgh. Not shown are Jack Cashell, Preston Oil Company, Columbus; O. L. Martin, McClure Oil Company, Mt. Pleasant, Mich.; and Douglas Rogers, Jr., South Penn Oil Company, Bradford, Penn., all district vice chairmen.

University of Texas To Offer Mud Course

A special summer graduate course on "Composition and Properties of Oil Well Drilling Fluids" will be conducted from August 26 through September 15, 1954, on the campus of The University of Texas at Austin. The three-week course is part of the University's Institute for Advanced Engineering, and is conducted by the College of Engineering in cooperation with the University's Division of Extension.

Walter F. Rogers, chief chemist, Gulf Oil Corporation, Houston, will be the principal lecturer, with Professor H. H. Power, chairman, Department of Petroleum Engineering at the University, as colecturer. They will be assisted in certain phases of the course by experts from industry.

Three semester hours of graduate extension credit are offered for those completing the course. Maximum enrollment is limited to 50, and prerequisites for the course are a B.S. degree in engineering, or a B.S. or B.A. in chemistry, geology or other acceptable science curriculum, including at least one year of active mud handling or the equivalent. Tuition is $125. W. R. Woolrich, dean, College of Engineering, The University of Texas 12, Austin, is handling enrollment.

Tulsa Engineers Club Names Williams President

Guy F. Williams, Dowell Incorporated, has been installed as president of the Engineers Club of Tulsa.

Other officers are H. Ross Bolton, Deep Rock Oil Corporation, executive vice president; Rex B. Benway, Schlumberger Well Surveying Corporation; J. A. Huitt, Deep Rock; Pat Murphy, Service Pipe Line Company; and Wayne C. Moody, Sunray Oil Corporation, vice president; and B. P. Waltz, Sinclair Oil and Gas Company, treasurer.

New directors are A. A. Hardy, W. C. Norris Manufacturer, Inc., Harold Meyer, DeLaval Steam Turbine Company; J. E. Myers, Black, Sivalls & Bryson, Inc.

Oil & Gas Association Names Fred E. Woodring President

Fred E. Woodring has been appointed executive vice president of the Rocky Mountain Oil & Gas Association. Woodring was employed in 1936 by the Sun Oil Company as an ordinary seaman and assigned to a tanker plying between Philadelphia and Texas. His advancement with Sun Oil encompassed all phases of the oil industry until his resignation in 1948 as traffic coordinator.

Fred E. Woodring

In 1949 Woodring was appointed executive secretary of the Wyoming Trucking Association, which he resigned to accept the Rocky Mountain association's appointment. He replaces William (Scotty) Jack, who resigned to become a candidate for governor of Wyoming.

Geological Society Plans Field Trip in Florida

The eighth field trip of the Southeastern Geological Society will be held Oct. 21-23. The trip will emphasize the carbonate rocks of South Florida. The first day will cover the area from Miami to Lake Okeechobee and the Caloosahatchee River. The second and third days will be spent on the Florida Keys to study processes of lime carbonate deposition and present day reef building.

Headquarters for the trip will be at Miami. Reservations will be accepted until October 1 and will require a $10 deposit. Complete information may be obtained from Louise Jordan, secretary, Southeastern Geological Society, Box 841, Tallahassee.

Geological Society Names M. Walter Wolf President

New officers of the North Dakota Geological Society are headed by M. Walter Wolf, The California Company, president. Others elected were Ray L. Harrison, Jr., Lion Oil Company, vice president; Jack M. DeLong, The Sun Oil Company, secretary; and John J. Magee, Socony-Vacuum Oil Company, treasurer.

Early Reservations Urged For AAODC Convention

Oil men planning to attend the fourteenth annual convention of the American Association of Oilwell Drilling Contractors in Los Angeles Oct. 10-13 are urged to write early for reservations.

Approximately 1000 registrants are expected. First applicants will be housed in the Biltmore Hotel, where the sessions will be held. Later applicants will be housed at neighboring hotels. Reservation requests should be sent to D. H. Graham, 2450 Cerritos, Long Beach.

What's Happening

AMONG SERVICE AND SUPPLY MEN

Coale Named General Manager Of Baroid Sales Division

George B. Coale has been appointed general manager of the Baroid Sales Division, National Lead Company, succeeding George L. Ratcliffe, vice president of National Lead Company. Ratcliffe served as the general manager of Baroid prior to Coale's appointment.

George B. Coale

Coale joined National Lead Company in 1935. At the time of his appointment as assistant general manager of Baroid in 1949, Coale was the chief engineer for the National Lead Company.

Ratcliffe will remain active with the Baroid Sales Division in his capacity of vice president, National Lead Company.

Kobe Division Is Purchased From Dresser Industries

Dresser Industries, Inc., one of the country's leading manufacturers of oil, gas and chemical equipment, has announced the sale of one of its operating units, Kobe, Inc. Division of Dresser Equipment Company, Huntington Park, Calif.

The Kobe Division manufactures and distributes hydraulic oil well pumping equipment.

H. N. Mallon, president, reported that the principals in the purchase were a group of investors headed by C. J. Coberly, inventor of the Koke hydraulic pumping process and founder of the company. Proceeds from the sale will be added to Dresser's working capital.

Halliburton Oil Well Cementing Observes Thirtieth Anniversary

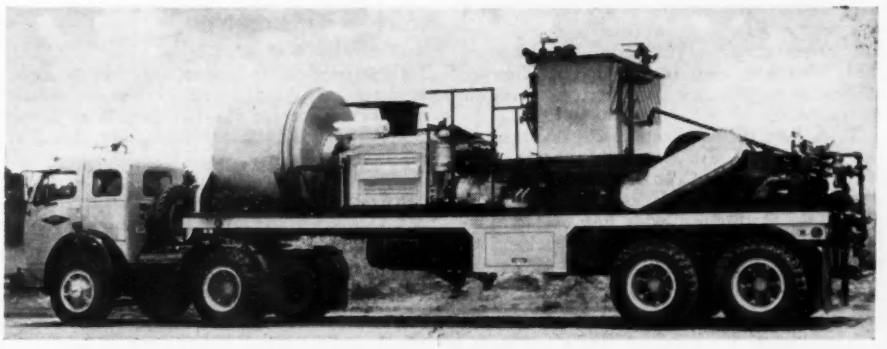
The thirtieth anniversary of Halliburton Oil Well Cementing Company was observed in July at the company's Duncan, Okla. headquarters. Fifteen men received engraved 30-year watches from Erle P. Halliburton, founder and chairman of the company.

The Halliburton company was incorporated on July 1, 1924 by Erle P. Halliburton. The new company then had 56 employees. Today, over 7000 men and women are employed in 23 states and 13 foreign countries.

Richard O'Brien Named Secretary Of Pressed Steel Car Company

Richard D. O'Brien has been elected secretary of Pressed Steel Car Company, Inc.

O'Brien has been assistant secretary of the company since August, 1951. Prior to this, he was associated with Baldwin, Todd & Lefferts, a New York City law firm.



Dowell Sends Cementing Unit to Gulf Coast

Shown above is the first cementer designed especially for use in conjunction with the recently developed permanent type well completion methods. This unit, featuring a rotary-type dry mixer tank and a paddle-type slurry mixing tank, will be based at Dowell's Houston station. The slurry tank is also equipped with high pressure circulating jets to insure complete hydration of bentonite, a component of the modified cement used for permanent cementing. The two pumps located at the rear of the float may be operated separately or in tandem by one or both of the V-8 industrial engines. All auxiliary equipment on this unit is hydraulically operated and controlled from the operator's platform.

Seismic Exploration Equipment Shown

At a recent sales meeting of Herb J. Hawthorne, Inc., the president distributed Doodlebugger wildcat bonus bucks to represent the economic savings possible through use of new seismic exploration equipment.

Hawthorne personnel shown above, left to right, are Bill Brooks, Engineering Supply Company, Tulsa; Bob Meisenbach, P. N. Smith, Seismic Service Supply Company, Calgary; Mrs. Willia Garceau, Bob Garceau, Basin Oil Field Supply Company, Wolf Point, Mont.; Charles T. Baker, Herb J. Hawthorne, Inc.; Herb J. Hawthorne; Buck Buckley, Engineering Supply Company, Dallas; Earl M. Weaver, vice president, Herb J. Hawthorne, Inc.; and Max Fountain, Herb J. Hawthorne, Inc.

Two New Supply Stores Opened By Jones & Laughlin Steel

Jones & Laughlin Steel Corporation, Supply Division, has announced the opening of two new stores in Paintsville, Ky., and Worland, Wyo.

The Paintsville store is under the supervision of H. E. Wagner, district sales manager of the Eastern District and Paul Somerville Will manage the store. H. C. Goodwin is moving to Paintsville as a salesman.

Under the supervision of M. A. Park, district sales manager of the North Rocky Mountain District, the Worland store will be managed by B. J. Gough and J. R. Robinson will be a salesman there.

Schlumberger Makes Appointments In Rocky Mountain Area Offices

Schlumberger Well Surveying Corporation has announced six personnel transfers and promotions in the Rocky Mountain area.

J. L. Heath has been appointed Northern Rocky Mountain division manager with offices at Casper, Wyo. Heath, who was formerly assistant manager of the Oklahoma division, succeeds C. A. Rosenthal, who has been transferred to Denver as Southern Rocky Mountain division manager.

T. A. Morris has been made assistant to the manager of the Rocky Mountain area office at Denver, Colo. He was formerly division manager in Mississippi. Morris replaces R. P. Burton who has been transferred from the Rocky Mountain area to become assistant to the manager of the North Louisiana area.

L. P. Vincent has been transferred from Wolf Point, Mont., to Midland, Texas, where he is assistant to the division manager. J. L. Hallman, field engineer at Wolf Point, has been placed in charge of that location.

Leschen Building New Home Office in St. Louis

Construction is under way on a new, modern, air-conditioned one-story headquarters office for the Leschen Wire Rope Division, H. K. Porter Company, Inc., in St. Louis.

The new office is located in the company's present property at 2725 Hamilton Avenue. Completion is scheduled for June 1.

California Distributor Named

Pictured above are J. J. Pike, president of The Republic Supply Company of California and Paul Courtney, president of Unit Rig & Equipment Company, completing arrangements for exclusive California distributorship of Unit Rig equipment by Republic. Pike, left, signs the distributor contract.

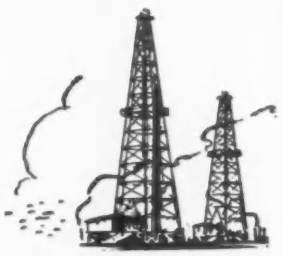
Second National Bank Begins Construction of Houston Skyscraper

Construction of the Second National Bank of Houston's new 24-story skyscraper was started in June. The all aluminum, block-square structure, expected to be completed in 1956, will be the largest building in Houston.

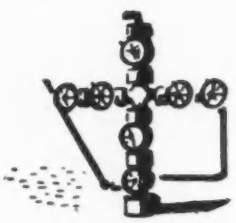
Col. W. B. Bates, chairman of the board of the bank, turned the first spade of earth at the ceremonies. Others participating were C. M. Malone, vice chairman of the board; L. R. Bryan, Jr., president; and A. G. McNeese, Jr., assistant president.

TK-2 SOLVES PIPE CORROSION AND PARAFFIN PROBLEMS

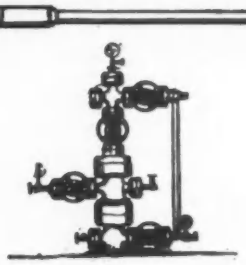
Here's why more than 7 million feet of pipe now in service are lined with TK-2 thermosetting plastic.



DRILL PIPE — Uncoated steel pipe used in a West Texas field failed because of corrosion after drilling only 5,000 feet. Drill pipe lined with TK-2 and used in same field has drilled to 70,000 feet without failure.



HIGH PRESSURE OIL WELLS—In wells where excessive carbon dioxide has been encountered, uncoated pipe has failed because of corrosion in 10 to 18 months. Pipe lined with TK-2 used in same wells showed no signs of corrosion even after 28 months.



GAS LIFT WELLS — Uncoated pipe installed in one field in 1949 failed because of corrosion after 2 years. Pipe lined with TK-2 used in same field is still in good condition after 5 years!

TK-2 is Tube-Kote's specially formulated plastic that is thermobonded to the interior surface of pipe, casing, tubing and other tubular items. It prevents corrosion, resists paraffin deposition — saves shutdown time and replacement costs!

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TUBE-KOTE PIONEERS IN PLASTIC SINCE 1939

Keyseat Tool Makes 2300-Mile Trip

Barranquilla, Colombia, is a long way from Houston but the distance can be spanned in a short time!

Recently a major oil producer in Colombia had need of a tool in a hurry. After a check of the Composite Catalog for specifications and a telephone call to McClinton Tool Company, manufacturer of Keyseat tools, this 13-foot, 1100 pound tool began its 2300-mile trip to the oil fields of South America.

The trip, costing $500, was made by Herrin Transportation Company from Houston to New Orleans; then from Moisant International Airport on a Pan American Airlines plane to Barranquilla by way of Panama. Four days after leaving Houston, the Keyseat tool arrived to take its place in the drill string.

SAFETY...first and fast

THIS team of Caterpillar D8 Tractors with MD8 Pipe Layers is lowering in 26-inch gas line near Greenville, Miss. On another stretch near here these husky machines, which are owned by H. C. Price Co. of Bartlesville, Okla., crossed three-quarters of a mile of flooded rice field in only two hours. That was real speed, but it was made with full regard for the safety of the pipe-laying crew.

Accuracy of control is vital in this work. The Cat* MD8 Pipe Layer has separate brakes and clutches on both boom and load line drums. Conveniently placed operating controls and a special, heavy-duty Caterpillar transmission mean precise placement of the pipe—and "built-in" safety for the men on the job.

The Cat D8 Tractor and MD8 Pipe Layer are a mighty combination. They have the balanced weight and power, the surefootedness in sticky going, the *muscles* to stay on the job with a minimum of maintenance. The long-wearing Diesel engine in the D8 develops an honest 148 HP, on low-cost No. 2 furnace oil.

Many spreads have standardized on Caterpillar equipment. They find, no matter where their jobs take them, that they can count on fast service from skilled Caterpillar Dealers.

Ask your nearby dealer for an on-the-job demonstration of Caterpillar track-type Tractors and Pipe Layers that fit *your* requirements.

Caterpillar Tractor Co., Peoria, Illinois , U.S.A.

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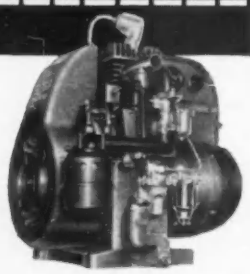
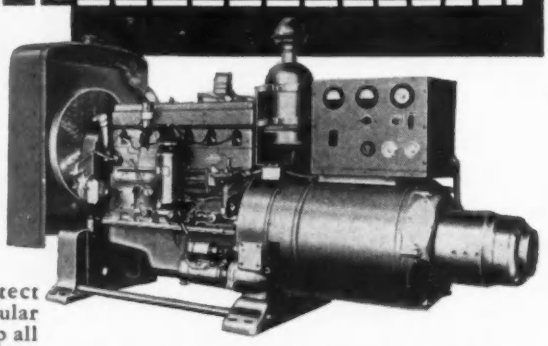
ONAN Standby Electric Power for Every Need!

FROM 1,000 TO 50,000 WATTS A. C.





ONAN Standby Plants protect lives and property when regular power is interrupted . . . keep all essential services and equipment operating. Compact, dependable, easy to install. Require minimum maintenance. Can be equipped to start and stop automatically.

FREE ESTIMATING SERVICE . . . Let us know your standby needs and we'll recommend the Onan plant to fit them.

GASOLINE-POWERED STANDBY PLANTS

Air-cooled: 1,000 to 10,000 watts. Powered by one and two-cylinder Onan engines.

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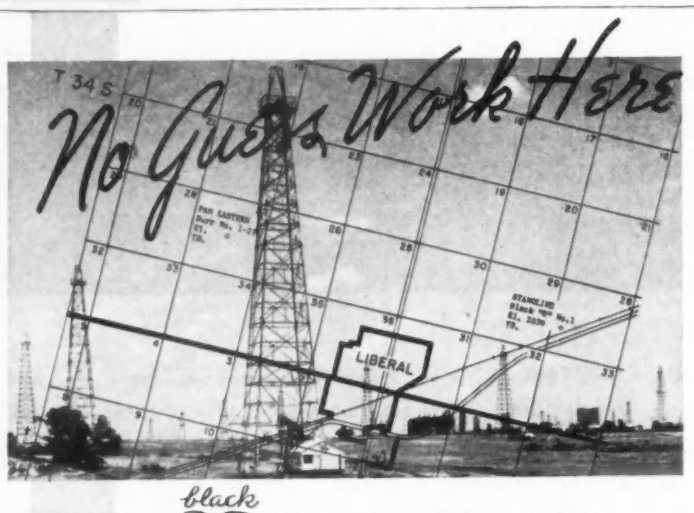

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William Ansdell

R. H. Windbigler

Allis-Chalmers Names Two To Industrial Sales Posts

R. H. Windbigler is appointed industrial sales manager, and William Ansdell is promoted to assistant industrial sales manager at the Kansas City branch of the Tractor Division, Allis-Chalmers Manufacturing Company. Windbigler succeeds Neil Pohl, who is now motor grader sales manager at the home office. The Kansas City branch of the company has territory in Missouri, Kansas and Oklahoma.

Windbigler has been industrial sales manager at the company's Dallas branch and has been active in working with the petroleum and petrochemical industry in Texas. Prior to that he was at Atlanta branch.

Ansdell has been in industrial sales at Kansas City branch since June, 1951. Prior to that he was with the Kansas State Highway Department following his graduation from Kansas State College in 1949.

National Supply Company Elects Arthur W. McKinney President

Arthur W. McKinney has been elected president of The National Supply Company. McKinney, who started with the company as a salesman in 1920, has served as executive vice president since 1948. He was elected to the presidency at a meeting of the board of directors in Pittsburgh.

Arthur W. McKinney

McKinney succeeds Alexander E. Walker, who relinquished the presidency. At the meeting, Walker was reelected chairman of the board and chief executive officer of the company.

Starting with National Supply following his discharge from the Army after World War I, McKinney won promotion to assistant manager of sales in 1929, manager of sales in 1934, general manager of sales in 1938, and vice president and general manager of sales in 1940.

Lane-Wells Announces Opening Of New Branch in Montana

Lane-Wells has opened the third Montana branch office at 205 Marias Avenue in Shelby. Bill R. Edmisson, the operator-in-charge, was transferred from Cody,

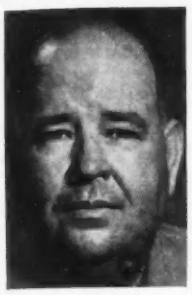
Wyo. The other two Montana branches are in Glendive and Billings.

S. W. Crain, formerly sub-district superintendent at Seminole, Okla., has been appointed assistant district superintendent of the Oklahoma district and transferred to Oklahoma City. He replaces E. D. Swartwood, who was transferred to Duncan, Okla., as a district sales engineer.

L. W. Denney, formerly radioactivity operator at Pampa, Texas, has been appointed district sales engineer at Pampa.

Tom Crain Joins McEvoy Company As Sales and Service Engineer

Tom Crain has joined the McEvoy Company as sales and service engineer in the New Orleans and Mississippi River Delta areas.



Tom Crain

Crain has had 25 years experience in the oil industry in the Mid-Continent and Gulf Coast areas.

Before coming with McEvoy Company he worked 12 years in New Orleans and the Harvey areas with associated companies in the oil industry.

New Tulsa Supply Company Formed by Frank Wheatley

The Frank Wheatley Supply Company, specializing in oil industry supplies and equipment, has recently been formed in Tulsa.

Officers are Frank Wheatley, Jr., president; Huber Dye, vice president and general manager; Gus Baker, vice president; and Clarence Hunter, secretary-treasurer.

Representatives include Harold Putnam and John Fitzpatrick, Tulsa; and Lloyd Gray, Bartlesville.

Lines to be handled are Frank Wheatley pumps and valves, Goodyear mechanical rubber products, Flexible Tube Corp, products, Fairbanks-Morse electric motors and centrifugal pumps and Chicago metal hose. Negotiations are in process for additional nationally-known lines.

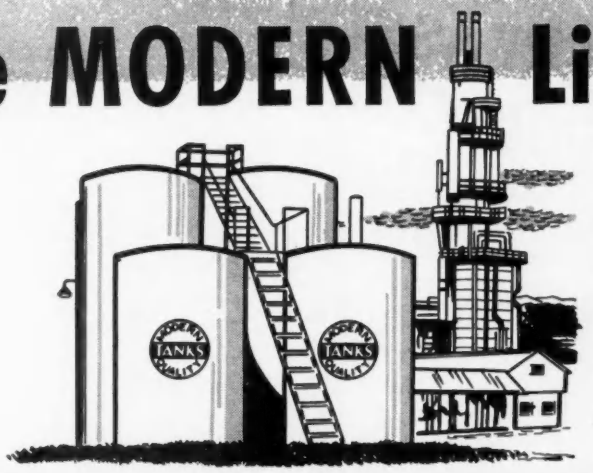
Temporary headquarters for the new concern are at Hale Station, Sand Springs Road, Tulsa. Sales offices are in Houston and Odessa, Texas; Shreveport and Lafayette, La.

Mid-Continent Supply Company Promotes W. G. Skinner

W. G. Skinner has been promoted to district machinery manager for Mid-Continent Supply Company at Tulsa, Okla. Skinner was formerly sales engineer for Mid-Continent at Midland, Texas, and has worked for the organization at Edmond and Pauls Valley, Okla. Skinner was graduated from high school at Okmulgee, Okla., before entering the University of Oklahoma, where he received a B.S. degree in mechanical engineering.

W. G. Skinner

The MODERN Line



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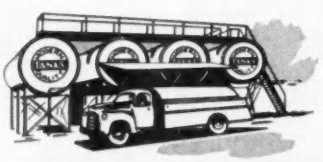
The MODERN line—the direct line to quality storage service. From the countryside oil well to the "cracking" plant . . . from bulk plant to service station . . . MODERN has a steel storage tank to fit your exacting needs . . . a tank approved by Underwriters' Laboratories. That's why today more and more petroleum distributors are specifying MODERN QUALITY tanks for their products. Phone your nearest MODERN plant. Join the hundreds of satisfied customers who reorder MODERN QUALITY tanks . . . a type and size to fit every storage problem.

Select the MODERN name . . . the MODERN line . . . guaranteed one year against defective material or workmanship.



MODERN QUALITY BULK STORAGE TANKS . . . available in horizontal or vertical installations . . . double butt-welded, fabricated and tested according to rigid standards for long, efficient service.

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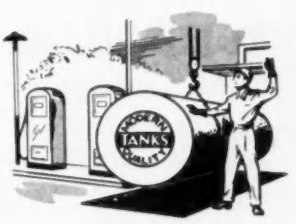

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PUMP & BAILER SIZES
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 inches.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3433

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EXPORT OFFICES
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NEW YORK CITY 20, N. Y.

Wilson Supply Company Completes New Store

The new store of the Wilson Supply Company was recently opened at McAllen, Texas. From this location oil and gas well supplies will be available to the industry in South Texas. Shown left to right are S. G. (Doc) Wyatt, general manager of stores; Wayne H. Harris, district manager; Kinney Hellums, store manager, and Bill Neef, office manager.

Contracts Awarded For Caterpillar Plant

Site preparation work for the new Caterpillar Tractor Company plant at Decatur, Ill., has begun. Contract for site preparation has been awarded to the construction firm of Jansen & Schaefer of Pekin, Ill. The contract includes all earth excavation, filling and grading, and also foundations for the heating plant and manufacturing building, and for a tunnel which will connect the two buildings. The work is scheduled to be completed by early September.

Six other contracts for work at the new plant have been awarded. Structural steel will be furnished and erected by the Mississippi Valley Steel Co., of Decatur.

The manufacturing building is to cover an area 880 by 830 feet with approximately 730,000 square feet of floor area and similar in design and appearance to the building now in use at Joliet, Ill. The office building also is to follow the general pattern of the office building at the company's Joliet plant.

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Pure Colloidal Concentrate

Removes and Prevents Boiler Scale and Corrosion!

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for ALL Radiator Cooling Systems, Diesel Rigs and Trucks

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You Have The World's Best Laboratory for Testing Hoists

Specifications are helpful guides in choosing the right hoist for your job. Factory tests give further assurance. But the hoists on your own job hold the key to your wisest final choice. These hoists have been tested in the world's best laboratory for your purposes. They have been operated by *your* men under *your own* exacting conditions. Their performance takes the guesswork out of choosing.

That's why Coffing Safety Pull Ratchet-Lever Hoists are standard on so many oil field jobs. Their record of durability and safety for more than 25 years under actual job conditions puts them in a class by themselves as the wise choice.

Examine the hoists in *your* "laboratory." Which is the oldest one in good working condition? When safety is vital, which hoist do your men use? We believe the answer is Coffing — the *original* ratchet-lever hoist. If you would like more information on the complete line of Coffing Ratchet-Lever hoists, write for catalog 08SP.

Quik-Lift Electric Hoists
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COFFING HOIST COMPANY
Danville, Illinois

George E. Failing

R. R. Morgan

E. L. Alexander

Robert M. Greer

George E. Failing Retires As President of Company

George E. Failing, founder of the George E. Failing Company, of Enid, Okla., manufacturers of portable drilling rigs for the oil, water well, mining, and construction industries, has announced his retirement as president of the company. He will continue his association with the company as a retained consultant.

R. R. Morgan of Cleveland, Ohio, vice president of the Cleveland Rock Drill division of the Le Roi Company of Milwaukee, Wis., has been selected by the directors to serve as the new president of the Failing Company. The Failing Company and the Le Roi Company both are subsidiaries of Westinghouse Air Brake Company of Pittsburgh.

Elected as a new member of the board of directors of the Failing Company was E. L. Alexander of Enid, vice president in charge of engineering. Robert M. Greer, first vice president of the Failing Company, will continue to serve as a member of the board also.

The Failing Company was purchased approximately one year ago by Westinghouse Air Brake Company.

Oil Well Supply Division Announces Four Changes in Gulf Coast Area

Recent changes in the Gulf Coast area of U. S. Steel's Oil Well Supply Division involved a district representative, two store managers, and a field representative.

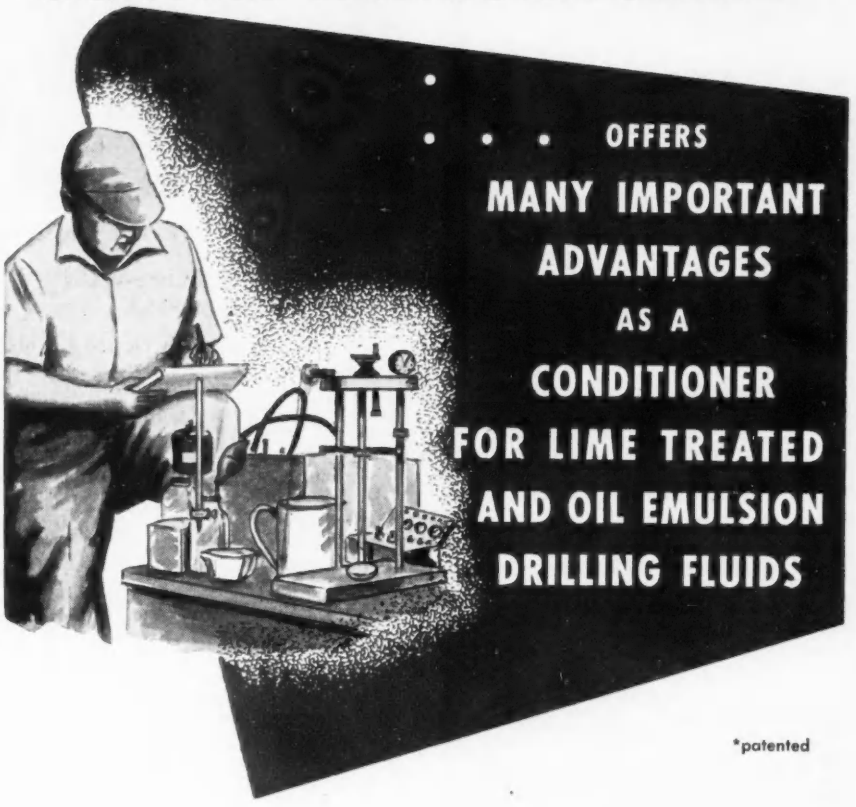
Robert C. Smith is Oilwell district engineer at New Iberia, La.; Kenneth M. King and Herman C. Streety are managers, respectively, of the Victoria and Alice, Texas, branch stores; and Thomas S. Kelly is field representative at the Corpus Christi, Texas, store.

Chicago Pneumatic Tool's Plant Begins Operation in Fort Worth

Chicago Pneumatic Tool Company's recently completed $4,500,000 plant in Fort Worth is now in full production on a complete line of oil well drilling equipment for the petroleum industry.

The plant consists of three attached buildings—a manufacturing building, an office building and a cafeteria.

MARATHON'S CALCIUM LIGNOSULFONATE*



This product, tradenamed KEMBREAK†, is the only lignosulfonate proved by years of successful use in oil well drilling. It is superior to other dispersants in several ways. For example, it . . .

1. Simplifies the preparation and control of muds with satisfactory properties over wider ranges of lime content and salt contamination.
2. Has greater solubility, permitting maintenance of lower pH lime muds.
3. Serves as an excellent emulsifying agent for oil even in the presence of lime and other electrolytes.
4. Stabilizes muds against the usually adverse effects of cement.
5. Is a highly refined, uniform quality product available in ample supply in 50 pound multiwall bags.

The field experience of many oil companies has convinced them of the advantages to be gained through the use of Marathon's calcium lignosulfonate in the preparation of lime base and oil emulsion muds. You, too, can guard against drilling failures, whenever difficult hole conditions are encountered, by using Kembreak†.

KEMBREAK†
may be obtained from

MILWHITE MUD SALES CO.
HOUSTON, TEXAS

MAGNET COVE BARIUM CORP.
HOUSTON, TEXAS

†Reg. T.M., Accuracy Rig Tool Company

MARATHON *Corporation*
CHEMICAL DIVISION
ROTHSCHILD • WISCONSIN

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

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TECHNICAL CONSULTING PRODUCTION ENGINEERING SERVICE, INCLUDING CORE ANALYSIS
PRESSURE MAINTENANCE WITH GAS OR WATER
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SURVEYS
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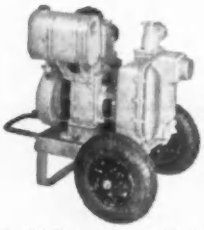
PUMP TROUBLE ?
Switch to Marine Products Co.'s Flomax line of ruggedly constructed self-priming centrifugals to end pump breakdowns.
The FLOMAX pumps are designed to last—to give long life on nasty jobs. They're "Built for the Sea."
BELT DRIVE FROM AVAILABLE POWER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Rodney S. Durkee

M. E. Montrose

Rodney S. Durkee of Lane-Wells Elected President of PESA

Rodney S. Durkee was elected president of the Petroleum Equipment Suppliers Association at the organization's nineteenth annual meeting, held at Manoir Richelieu, Murray Bay, Quebec, Canada, June 28-July 1. Durkee is president of Lane-Wells Company, with headquarters in Los Angeles.

Other newly-elected officers are vice president, M. E. Montrose, Hughes Tool Company, Houston; treasurer, Wharton Weems, Vinson, Elkins, Weems & Searle, Houston; assistant treasurer, Leroy Jeffers, Vinson, Elkins, Weems & Searle, Houston; executive secretary, H. R. Safford, Jr., Houston.

The following were elected to the executive committee: Eastern District, Lloyd N. Lanphere, Ajax Iron Works, Corry, Penn.; Mid-Continent and Rocky Mountain District, Rainey Elliott, Jones & Laughlin Steel Corporation, Supply division, Tulsa; Southwestern District, George O'Leary, Houston Oil Field Material Co., Inc., Houston; Pacific District, Ott Hammer, Dresser Operations, Inc., Security Engineering Division, Whittier, Calif.

The executive committee together with the president and vice president comprise the operating committee. The executive committee is composed of chairmen of the boards of directors from the districts, each of whom is elected by board members within his own district.

The guest speakers at the convention were: John F. Skillman, deputy director, ACME Division, Business and Defense Services Administration, U. S. Department of Commerce; Dr. John Davis, associate director, Economic Branch, Department of Trade and Commerce of the Canadian Government.

Jaeger Named Publicity Manager Of Bucyrus-Erie Company

Martin B. Jaeger has been promoted to publicity manager of Bucyrus-Erie Company to succeed Emory M. Heuston, who left to join an industrial advertising agency. Heuston had been publicity manager since 1945.

Martin B. Jaeger

Jaeger, who has been assistant publiity manager for three years, joined the company in 1943. In his new post Jaeger will have responsibility for direction of the company's product advertising and publicity programs.

Griffith Joins McEvoy Company As Sales-Service Engineer

Carl Griffith has joined McEvoy Company as sales and service engineer in the Ark-La-Tex areas with headquarters in Shreveport.

Carl Griffith

Griffith has worked in the oil industry for the past 15 years in the Gulf Coast and Ark-La-Tex areas, spending the past seven years in selling and servicing oil field well completion equipment in the Shreveport area. Griffith's past experience qualifies him to assist oil producing companies and drilling companies in the numerous phases of oil field production and well completions.

Griffith is a native of Sulphur, La.

Horner Named to Two Posts With Core Laboratories

Core Laboratories, Inc., has announced the appointment of William L. Horner as manager of reservoir engineering operations and his election as a vice president of the company.

William L. Horner

Horner will head Core Lab's expanded activities in pressure maintenance, water flooding, unitization projects and property evaluation, including the management of producing properties.

Since 1943 Horner has served Sunray Oil Corporation and Barnsdall Oil Company, Tulsa, as manager of secondary recovery and later as chief engineer of production. In 1952 he was elected vice president in charge of Sunray's reservoir production activities. Horner will maintain offices in Dallas.

Southern Engine and Pump Co. Named Distributor for Peerless

Appointment of Southern Engine and Pump Company, as distributor for Peerless vertical and horizontal pumps in southern Louisiana and southern part of Mississippi has been announced by Peerless Pump Division of Decatur, Ga.

Peerless Pumps will be sold and serviced through Southern Engine and Pump Company branches at Lafayette and New Orleans, La.

Peerless Pumps are added to their present lines in Louisiana which include Le Roi engines, Nordberg diesel engines, generator sets and pumping units.

Lane-Wells Offices Number 97 With New Branch in Oklahoma

Lane-Wells Company has opened a branch at 1701 West Fifth Street, Bartlesville, Okla. Robert D. Johnson has been appointed station superintendent there and transferred from Perry. This brings to a total of 97 the number of Lane-Wells branches in the U. S., Venezuela and Canada.

Sterling Heads Denver Office Of Lucey Products Corporation

Lucey Products Corporation announces the appointment of Norman Sterling, Jr., as district manager of its Rocky Mountain operations. Offices have been established in the Kittredge Building at Denver.

Sterling has served in the sales organizations of Broderick & Bascom Rope Company and Waukesha Engine & Equipment Company. A native of Houston, Sterling attended John Tarleton College at Stephenville, Texas.

Norman Sterling, Jr.

Welex Jet Services Announces Five Personnel Appointments

W. Ray Marshall has been moved to Houston as district manager for Welex Jet Services. A veteran of more than 17 years in oil well service work, Marshall formerly was Welex district manager at Victoria.

Other Welex appointments include Jack H. Smith, named Dallas city salesman; E. B. Schulz, sales engineer in the San Angelo office; Joseph W. Farmer, sales administrative assistant in charge of advertising and public relations; and George C. Crowley, Jr., Victoria district manager for Welex.

A. O. Smith Names Spoor Assistant Division Manager

John W. Spoor has been appointed to the newly-created post of assistant division manager of the Welding Products Division of the A. O. Smith Corp. He is succeeded as general sales manager by Richard W. Raney.

Spoor came to A. O. Smith in 1948 from the Brunswick-Balke-Collender Company at Chicago, where he was assistant to the vice president—sales. He headed A. O. Smith's Product Service division at Chicago before taking over Welding Products sales responsibility.

Formerly vice president—sales for Arms-Franklin Corporation at Youngstown, Ohio, Raney came to A. O. Smith in 1952 and was named assistant division general sales manager in 1953.

Erv A. Steidl, who was sales representative for A. O. Smith industrial safety grating in the Middle West in the past three years, now is the Welding Products division's sales engineer for Wisconsin.

National Supply Company Promotes Yeatman and Malloy

Promotion of Alwyn F. Yeatman to manager, sales accounting, and appointment of Edward B. Malloy to succeed him as general auditor have been announced by The National Supply Company.

Yeatman has been associated with the company since 1949. He was named assistant general auditor in 1951 and general auditor in 1952.

Malloy comes to National Supply after six years with Touche, Niven, Bailey & Smart, certified public accountants.

Maloney-Crawford Company Names Ethridge Assistant Chief Engineer

Ben R. Ethridge, Maloney-Crawford Tank & Manufacturing Company sales engineer at Houston and Corpus Christi for the past two years, has been promoted to assistant chief engineer.

An engineering graduate of Texas A & M College, Ethridge has had varied oil field experience. He will serve under Arnol I. Sellars, chief engineer, and will make his headquarters in Tulsa.

Ben R. Ethridge

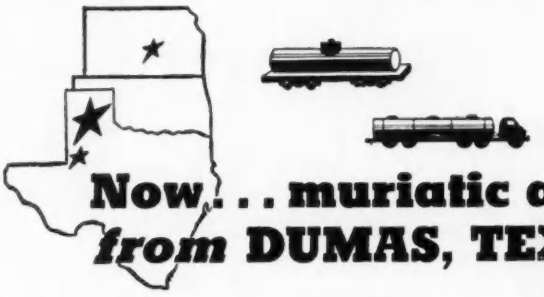
Link-Belt Africa Limited Names R. F. Bergmann Sales Manager

Link-Belt Company announces the appointment of Richard F. Bergmann, Jr. as sales manager of Link-Belt Africa Limited with headquarters at the plant in Springs, Transvaal, Union of South Africa. He replaces Gene A. Zwerner who is returning to Link-Belt Company in the U. S.

Bergmann started with the company in 1948 as a draftsman in the Minneapolis plant. Later he was advanced to sales representative and, for the past four years, has served as a sales engineer at Minneapolis. Previous to 1948 he worked as a part-time draftsman at the Chicago and Los Angeles plants.

HOLD HIS ATTENTION TILL I CAN GET US TO ALEXANDER SHIPYARD FOR REPAIRS!

QUICK, EFFICIENT MARINE REPAIRS



Now . . . muriatic acid from DUMAS, TEXAS

Muriatic acid in tank car or highway tanker lots is now promptly available from a new shipping point – Dumas, Texas. Frontier has contracted for the entire HCl output of the Potash Corporation of America plant there – as an additional service to Frontier customers.

Frontier-owned plants and their products are:

Denver City, Texas – caustic soda, muriatic acid, salt
Wichita, Kansas – caustic soda, muriatic acid, chlorine, benzene hexachloride

Speedy shipment over uncongested routes brings dependable "always-as-specified" Frontier chemicals within overnight reach of many users . . . offers transportation and storage savings. Check with us . . . now!

GEARED TO SERVE THE OIL INDUSTRY

Frontier Chemical Company — Electro-Chemical Manufacturers

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321 WEST DOUGLAS
WICHITA, KANSAS
PHONE 7-5215

Wichita, Kans. • Denver City, Tex. • Midland, Tex. • Denver, Colo. • Dumas, Tex.

S. B. Sargent

E. J. Sargent

Sargent Engineering Corporation Reorganizes, Appoints Officers

Sargent Engineering Corporation has announced a reorganization and appointment of administrative officers.

S. B. Sargent is president and E. J. Sargent, formerly vice president and director of production, has been made executive vice president and general manager of the firm. G. L. Sargent remains as secretary-treasurer of the company.

Four new vice presidents recently named are H. L. Sargent, vice president—Oil Tool division; Thomas G. Foley, vice president—production; Frank L. Weber, vice president—internal auditing; and W. H. Sargent, vice president—public relations and advertising.

Hunt Tool Buys Facilities Of S&R Tool at Harvey, La.

Hunt Tool Company announces the purchase of the S&R Tool Company facilities at Harvey, La. These facilities will be operated as the Hunt Tool Company, Marine Division.

Roscoe Jarman

Robert W. Curtis

Cardinal Chemical Appoints Jarman and Curtis to Sales Posts

Cardinal Chemical, Inc. has announced the transfer of Roscoe Jarman, former assistant chemist, Cardinal Research Laboratories, at Odessa, Texas, to Norcor sales; and the appointment of Robert W. Curtis as new Gulf Coast representative.

Curtis will handle sales and service for the Cardinal series of advanced corrosion inhibitors marketed under the name "Nocor."

An engineering major at Texas Tech, Jarman joined the Cardinal research staff in early 1953 and has been actively engaged in the development of new inhibitors in the Nocor series.

Rolo Manufacturing Promotes Kail to General Sales Manager

Ray S. Kail, formerly South Texas sales representative for Rolo Manufacturing Company, Houston, has been promoted to general sales manager for the company.

Ray S. Kail

Kail served 15 years as division petroleum engineer with Baker Oil Tool Company, in the West Coast and Mid-Continent areas. During this time, he assisted in the development of new equipment, as well as in sales and supervision of the installation of Baker products.

Before joining Rolo as South Texas representative 3½ years ago, Kail was under contract for five years with Petroleos Mexicanos in the Republic of Mexico, as a special petroleum engineer and assistant to the production manager.

New Midwestern Sales Office Opened by Morse Chain Company

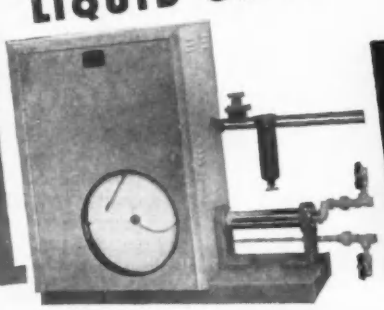
Expansion of the nationwide sales organization of Morse Chain Company has been announced. A new Midwest sales territory embracing the states of Wyoming, Utah, Colorado, Nebraska, Kansas, Missouri and parts of Illinois, Kentucky, Tennessee, Mississippi and Arkansas has been established to assist present Morse representatives, and 23 distributors in the area.

C. B. Lane, newly-appointed factory representative, will head the new midwestern sales office, in Overland Park, Kansas. He was formerly a power transmission equipment salesman for Noelling Steel Sales Corporation in Kansas City.

The appointment of R. J. Donachie as manager of the Morse Chain Philadelphia office was also announced. Donachie will occupy new quarters at Bala-Cynwyd, Penn.

ARCCO

ARCCO-ANUBIS
RECORDING CONTROLLING* LIQUID GRAVITOMETER



CONTROLS BLENDING OF TWO OR MORE FINISHED PRODUCTS

. . . for Pipelines, Refineries, Chemical Plants, etc.

This new instrument serves to determine and record the specific gravity of liquids in the same manner as the standard Arcco-Anubis liquid gravitometer.

*In addition to these features, a controlling mechanism is provided, which may be pre-set to operate the pipe line, refinery, still and plant control valves to any specific gravity range required in blending two or more finished products.

Temperature corrected, this extremely accurate instrument is adaptable to high pressures and is available with internal parts of stainless steel for use with corrosive liquids. Send for bulletin No. 111 A.

AMERICAN RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.

Available for Early Delivery

SEND FOR BULLETIN No. 111-A

WORLD OIL'S Trading Post
CLASSIFIED ADVERTISING

RATES: **Regular Classified** (undisplayed) set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. **Situation wanted** ads, 6 cents per word. **Display ads,** set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. **All classified ads payable in advance. COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: **Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

FOR SALE

GASOLINE PLANT
FOR SALE

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

■ FOR SALE: Cooper model "D" 2-drum oil field hoist, powered by Allis-Chalmers 565 cu. in. slow-speed engine. Line speeds from 21 to 1000 ft. per minute. Bare line ratings up to 52,000 lbs. Contact Layne Ohio Co., 1100 W. Town St., Columbus 22, Ohio. Telephone Fletcher 3803.

FRANKS MODEL 5000 Spudder—Serial No. 866
Sales Price—$7,500

Equipped with one Cummins HB1-600 Engine in good condition. Brake rims in fair condition; Brake blocks—Good. General appearance—Good. Chains—Good. Basic Machine equipped with Spudding attachment, Skid and 65' Double Leg Pipe Mast with 8⅝" and 7" Pipe Legs; 4-Sheave Crown of Wilson Manufacture. Price includes Mast Guy Lines.

Location of Unit—Western Kansas
Contact Cardwell—Wichita

Use the Readers' Service Cards

For more information on New Equipment described in this issue, for copies of the literature reviewed, and for data on any advertised products, use the Readers' Service Cards on the last page, just inside the back cover. Circle on the card the editorial or advertising code numbers of the items desired. Sign and mail the card. Your requests will be forwarded to the manufacturer and the information will be mailed directly to you.

FOR SALE

WILSON GIANT—Serial No. 6383
Sales Price—$6,000

Equipped with Two Waukesha 145 GK Engines in good condition. General appearance—Fair. Rig used for Work-Over. Price includes Kelco Spinning and Foster Breakout Catheads; Stromberg-McCreary Air Starters on Engines. Brakes circulating water-cooled; Manual Friction Clutches in Transmission; Others—Jaw Clutches. Rig has Slush Pump Drive and Rotary Drive.

Location of Unit—Lake Charles, Louisiana
Contact Cardwell—Houston

FRANKS ETS—5000—Single Drum Hoist Less Engine
Sales Price—$1,500

General Appearance—Good. Unit complete with Franks Power Take-Off; Mounted on Steel and Wood Truck Bed.

Location of Unit—Winfield, Kansas
Contact Cardwell—Wichita

WILSON ATLAS
Sales Price—$21,000.00

Equipped with two L1-600 Cummins Diesel Engines in good condition: includes pump drive, 12 PD groove sheave and V-belts. One American cathead and one plain spool cathead. Compound enclosed oil-bath. Includes one 1000 gal. fuel tank. Contact Cardwell—Houston.

HELP WANTED

Petroleum Engineers

Major oil company in South America has varied positions for single graduate engineers. Must have minimum one year each production and engineering experience. Reply giving full details—age, experience, college, military status, etc. Box 29-W, c/o World Oil, Houston, Texas.

SITUATIONS WANTED

Young man, Holland-American background, with widespread contacts, and whose experience as landman, oil company executive and independent particularly fits him to new or expanding operations, seeks association with enterprising individual or company. Can offer unusual talents for unusual job. Box 26-W, c/o World Oil, Houston, Texas.

DECALS

■ TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

BUSINESS OPPORTUNITIES

■ *REO SYSTEM INC. . . . helps you buy DIRECT FROM OWNER.* Oil Field Equipment necessary in contracting business. Includes casing pulling machines, spiders, arch bars, jacks. In Oklahoma—to be moved anywhere. Price reduced from $5750 to $4750 for quick sale. Free details upon request. Contact . . . REO SYSTEM, INC., 6 West 10th St., Kansas City, Mo. *All types businesses - throughout the nation.*

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P. O. Box 1628	146 Allen Building
Hobbs, New Mexico	Midland, Texas
Phone 3-3141	Phone 2-2962

■ HAVE 9200 acre block in Harding County, New Mexico. Wish to contact interested parties to help develop. Drilling contractor also desired to participate as partner. Contact J. J. Enkich, 1207B No. Osage Dr., Tulsa, Okla.

GEOPHYSICAL SERVICE

■ OIL LOCATING SERVICE! Determine approximate depth and thickness of oil zones. Drilling locations pin-pointed. NO OTHER GEOPHYSICAL WORK NEEDED! Documentary proof of success. WORTH INVESTIGATING! YOUNG AND CRITCHLOW, 1975 NW Everett, Portland, Oregon.

■ GEOLOGICAL MAPS and FILM. West Texas and southeast New Mexico. Scale 1" = 8,000'. One set Permian datum, one set Pre-Permian datum. Sample and electric log datum. (Also film without datum). BASIN OIL MAP SERVICE, 1600 Bedford Drive, Midland, Texas.

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WORLD OIL'S
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DRILLING CONTRACTORS' ISSUE

Make your advertising space reservations now.

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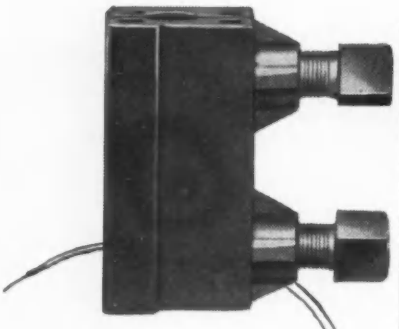


SAFE POSITIVE ACTION

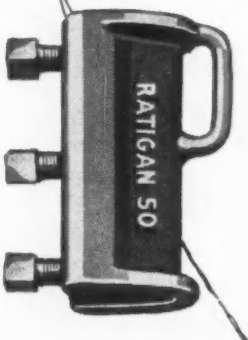
with

RATIGAN

SURE GRIPS

Ratigan "Sure Grip" Polished Rod Grips have proved extremely popular because of their exceptional gripping and holding power. Once properly installed, you can almost forget them.

Ratigan Grips are designed to accommodate present type pumping units and have a holding capacity of approximately 53,000 lbs., yet are lightweight. Both the Ratigan No. 204 and No. 50 Polished Rod Grips are made in sizes for 1⅛", 1¼", and 1½" polished rods, the No. 204 being particularly suited for pumping units which require a short and narrow gripping device.



All Ratigan Products Are Sold By Leading Supply Stores Everywhere

J. P. RATIGAN, Inc.
1213 Santa Fe Ave., Los Angeles 21
Export: National Supply Co., Inc., Export Div.
600 Fifth Ave., New York 20, N.Y.

SQUEAKS from the BULLWHEEL

Not at Home

"Is your daddy home, sonny?"

"No, sir. He hasn't been home since Mama caught Santa Claus kissing the maid."

Sucker

The battered car rattled up to the gate at the football stadium.

"Twenty-five cents for the car," said the parking lot attendant.

"Sold," replied the driver.

Voyage

The ocean liner had sailed into heavy storms on its first night out. The 12 privileged passengers who gathered at the Captain's table for dinner wore rather uncertain looks, but the Captain decided to go ahead with his usual welcoming speech.

"I hope," he began, "that you 12 will have a good crossing . . . It is a real pleasure to me to see on your 11 bright faces the cordiality you 10 feel at this gathering of 9 strangers to partake of your 8 dinners. After the meal if you 4 care for a game of bridge, I shall be happy to entertain both of you in my cabin. Or perhaps, sir, you will join me at the bar? All right, waiter, clear the table. I don't intend to eat alone."

Just in Time!

He was one of those tourists who like to brag about the number of miles traveled in a day. As the evening wore on they passed motel after motel with the "No Vacancy" sign out.

Finally the little woman remarked sweetly, "I know we'll find one soon, dear . . . people are starting to get up."

George is a toolpusher—we move around a lot.

Modern Outlook

During a severe electrical storm, the parent of young Jimmy, age 5, thinking he might be awake and frightened, looked into his room. He opened his eyes and mumbled, "What's Daddy doing with the television set now?"

Blue Ribbon Garden

"My garden was such a success this year," boasted a gentleman farmer, "that my neighbor's chickens took first prize at the poultry show."

Gotkool
water cans and coolers
GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.
KEEP PURE DRINKING WATER ALWAYS HANDY
GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!
STANDARD OF THE OIL FIELDS
Insist on the Genuine
Gott
GOTKOOL WATER COOLER
PURE WATER
H. P. GOTT MFG. CO.
WINFIELD, KANSAS

It Pays . . .

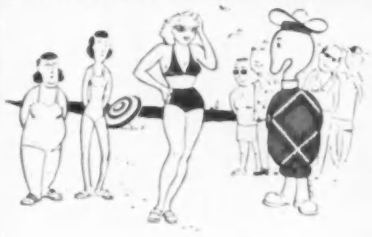
. . . to put the shots where they count!

McCULLOUGH M-3 BULLET GUN
and **GLASS JET *PERFORATORS***

Simultaneous firing (holes in the casing exactly as in the gun itself), exact measurements, multiple zone shooting, burrless bullets, and up to 50% deeper penetration. Write for your copy of "HOW TO GET MORE OIL."

McCullough
TOOL COMPANY
LOS ANGELES • HOUSTON • EDMONTON
OVER 40 OIL FIELD SERVICE BRANCHES
SERVICE ANYWHERE—ANYTIME

FOR BEST RESULTS LOG AND PERFORATE BY McCULLOUGH



Scotty McBlock adds up the FACTS and looks at the FIGURE

The facts are . . .

Series "80"

TUBING BLOCKS

add up to . . .

More weight, greater capacity — free, true falls.

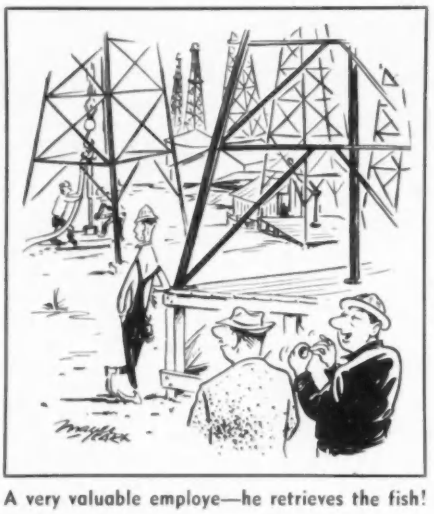
Larger range of sheave SIZES, 17"-20"-24". Less friction loss, roller bearing sheaves, roller thrust bearing hook.

J-M "Klipper" Grease Seals on all Sheave bearings.

McKISSICK

McKISSICK PRODUCTS CORPORATION

Box 2496 Tulsa, Oklahoma



A very valuable employe—he retrieves the fish!

The Unemployment Solution

"I know how to solve the unemployment problem," said Boogy.

"Many great men have tried and failed. How would you do it?" asked Woogy.

"If we could place all the men on one continent and all the women on another continent, everybody would be busy in no time."

"And what would everybody be so busy doing?"

"Why, boat building, of course."

Oil History a La Hah-Vard

". . . The purpose of the $300,000 loan from the Mellons was to finance construction of the rotary rig. This rig was referred to by the natives of Beaumont as a 'spindletop' and the field thus came to be known by that name." (Refers to the loan that Guffey and Galey obtained in connection with the contract with Capt. A. F. Lucas, as presented on page 75 of "The Growth of Integrated Oil Companies" by J. G. McLean and R. M. Haigh, Harvard University (1954).

Time's A-Wasting

The old man noticed the young fellow with a bottle in one hand and his arm around a pretty girl. "The dern whippersnapper is wastin' a lot o' time," he mused. "He can drink when he gets old."

Marriage Planned

A farm boy said to his brother, "Reuben, how would you get a girl to marry you?"

Reuben answered, "Well, if she don't want to, you can't; but if she does, there ain't hardly no way to prevent it."

Nationalism

An American and a Dutchman were talking. "What does your flag look like?" asked the American. "It has three stripes," replied the Dutchman, "red, white and blue. We say they have a connection with our taxes: we get red when we talk about them, white when we get our tax bill, and we pay 'til we're blue in the face."

"That's just how it is here," commented the American, "only we see stars, too."

Just About the Same

A lecturer was giving a talk before a women's club on life in Egypt, past and present. He mentioned how careless some of the Egyptians were toward their wives. "Why, it is no novelty at all," he said, "to see a woman and a donkey hitched together over there."

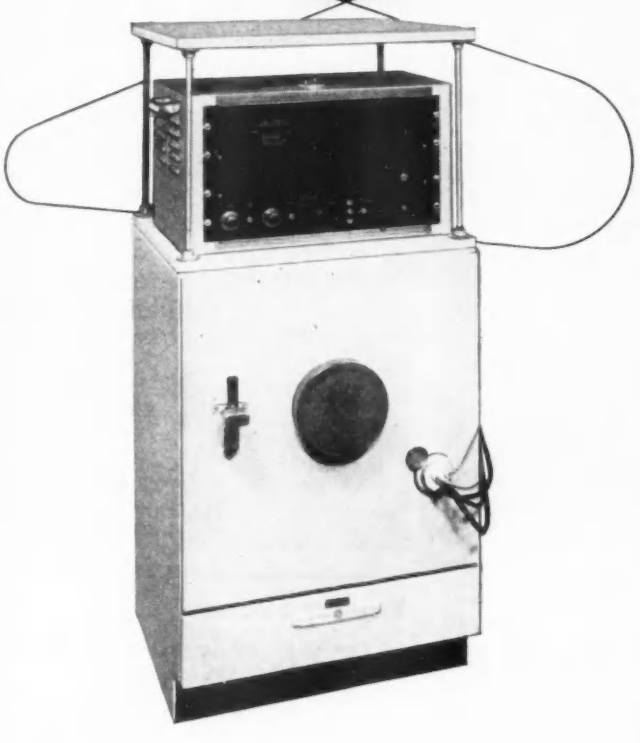
"Come to think of it," volunteered a voice from the rear, "it's no novelty in this country either."

Pen Pals

The children of the third grade were going to draw pictures and write letters to boys and girls in foreign countries. The teacher gave out names and addresses and one little boy got a girl in Holland for a pen pal. That night he breezed into the house and announced cheerfully, "Guess what, Mom, I got a girl in Dutch!"

*"When the job calls for shaped-charge perforating – **THAT** means **KONESHOT**-★-★-★! (Lane-Wells shaped-charge perforating!)*

LIQUID SCINTILLATION DETECTOR

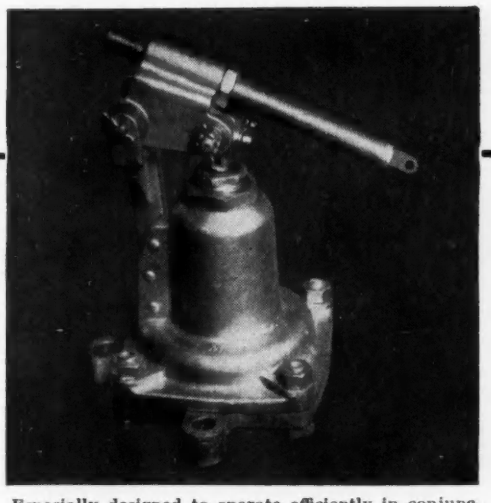


Tracerlab's unique CE-1 Liquid Scintillation Detector is designed primarily for counting samples of low energy beta emitters such as C-14 and Tritium, which can be prepared in liquid form. Efficiencies of approximately 75% for C-14 and 20 to 25% for Tritium can be obtained with this unit. The total sample volume is 50 cc and sample preparation is extremely simple.

An extremely low background of only 200 to 250 CPM is obtained by refrigeration of the phototubes, use of a dual-channel coincidence amplifier which passes only pulses which occur at the same time, and an overpulse rejection circuit. The two photomultiplier tubes with preamplifiers and a scintillation cell are mounted inside a lead shield in a small refrigerator. Samples may be stored in the dark before counting and a glove port permits transferring samples without exposure to light.

Booklet TL 59 contains complete details and will be sent upon request.

Tracerlab Inc.
130 HIGH ST., BOSTON
2030 WRIGHT AVE., RICHMOND, CAL.



Especially designed to operate efficiently in conjunction with a Westinghouse Controlair® Valve, this new Westinghouse Actuator provides precise positioning for engine throttles.

WESTINGHOUSE PNEUMATIC CONTROL speeds up rig operation

● A touch of your finger on a smooth-acting Westinghouse Pneumatic Control Valve precisely adjusts the speed of your engines. It feeds controlled air pressure to a Westinghouse Actuator Positioner, which positions the throttle further open or further closed to produce the exact engine speed you want. The great accuracy and effortless operation of these controls help you work faster and cut down drilling time and cost.

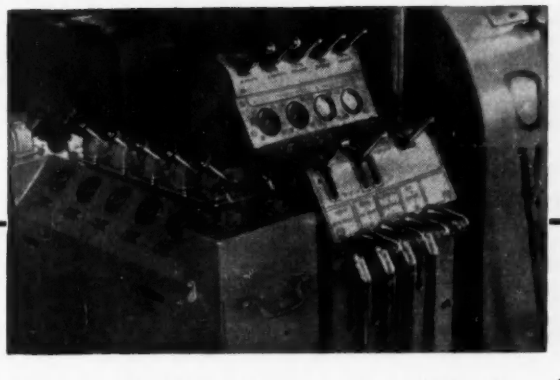
Westinghouse Air Brake Co. pneumatic devices—valves, relays, actuators, cylinders, filters, compressors—are made for each other; they form an efficient smooth-working team that assures *accurate* control of throttles, clutches, and brakes on drilling rigs.

Write for further information.

Westinghouse Air Brake COMPANY

INDUSTRIAL PRODUCTS DIVISION WILMERDING, PENNA.

Manufacturers of air compressors, pneumatic cylinders, actuators, air control devices, engineered pneumatic control systems and front end loaders.



What's New in Equipment

Drilling • Production • Exploration

Mechanical Rathole Machine

A mechanical rat hole machine is being manufactured by Southwest Steel Corporation. The machine is designed to eliminate rathole drilling operations and prevent wear and tear to the drilling rig, especially the kelly and drilling hose which is protected during transportation and carried as a unit on the collapsed machine after the hose has been disconnected at the standpipe.

The device provides center-line connecting and disconnecting of hook to swivel bail, thus eliminating swinging of the blocks or using the cathead during storing operations of the kelly assembly outside of the derrick platform. The swivel rests on the inner end of the securely locked upper beam and eight feet above and near edge of derrick floor out of the way when in outward storage position. This is accomplished through a forward and backward, nine-foot movement of the upper beam carried by an A-frame dolly, movable at base by an electric-powered gear box drive controlled from the derrick floor. The upper beam being pivoted at the center is moved from horizontal to a partial vertical position and vice versa through the weight of the lower end of the kelly carrying dolly passing over center.

There is a vacant place on open-type derricks for this machine to operate, over the conventional rathole area, between the derrick leg (standpipe side) and the corner of the derrick floor. The machine base is located on the ground clear of the pipe racks.

For more data circle **No. E1** on Readers' Service Card, last page this issue.

Portable Truck Cab

The Glasspar Company, has delivered a prototype of a portable truck cab for transporting photographic and electronic instruments used in oil exploration activities.

Initial experience with the cab, termed "Porta-cab," in the Mississippi area has proved so satisfactory that one company has ordered additional units for earliest possible delivery, before completion of tests with the prototype.

Salient features of the unit include a saving in weight, freedom from corrosion, impact resistance and freedom from galvanic action. Each of these is important to research operation on the Gulf Coast, and in South America for which the unit is intended.

Aluminum cab which this unit replaces weighs 397 pounds as opposed to the Porta-cab's 202 pounds, a saving of 195 pounds. Normal use requires that it be carried either upon the truck illustrated, a marsh buggy, rice tractor, raft or boat.

For more data circle **No. E2** on Readers' Service Card, last page this issue.

Tractor Shoes

Crawler tractor owners using their machines on rock and other hard surfaces with the resultant heavy wear may now purchase double grouser track shoes for Caterpillar D8 tractors.

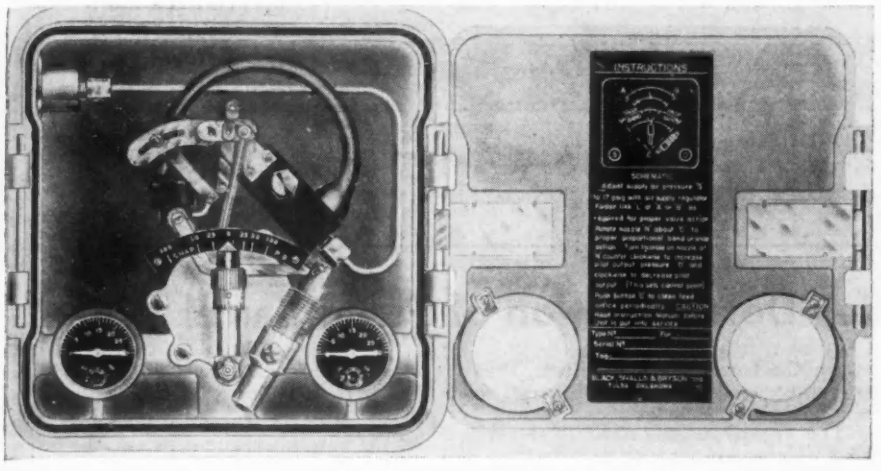
In areas where the tractor is working in blasted rock, the track shoes suffer from extreme wear due to track slippage and also from bending which causes ultimate failure. The double grouser track shoe is designed for a considerably greater resistance to bending, something in the order of 300 percent or more. Resistance to bending is achieved by having two parallel grousers lower in height than the single grouser shoe but wider. Also the body of the shoe is made thicker, all at the expense of added weight but designed for the best usage of material to gain the greatest possible resistance to bending.

The second grouser at the mid-section of the shoe provides protection to the track shoe bolt heads, so that they are not subjected to pounding which causes loosening of the bolts. The grouser tips are wide and extremely hard, which increases the wearing area over the single grouser more than three times.

It is obvious that such a design of shoe is aimed at a particular type of service where the footing creates severe bending stresses in the track shoe and where the rate of wear is extremely high due to track slippage and tearing of metal away from the shoe in extremely rocky footing. It is also obvious that this design of shoe is not comparable to the single grouser shoe under normal soil conditions where the most important factor in the track shoe design is good soil penetration for maximum traction or drawbar pull.

For more data circle **No. E3** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

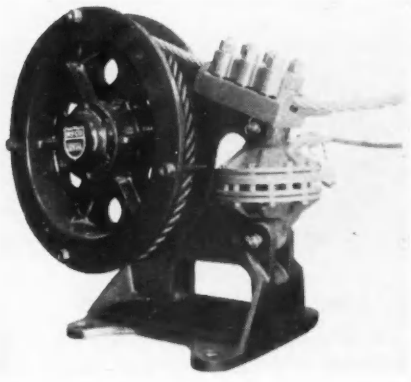


Pressure Controller

Black, Sivalls and Bryson, Inc. has introduced the new Type 1440 pressure controller (non-recording) for sensitive pressure-vacuum control systems. Designed to handle both positive and negative pressures from high vacuum to pressures up to 10,000 pounds, the Type 1440 is an instrument of accuracy. It is Bourdon Tube actuated with settings carefully calibrated including vernier setting for fine adjustment. Proportional band and "on-off" or maximum-minimum snap action adjustment is easily made without additional parts. Either action may be adjusted to pressures up to 75 percent of the limits of the Bourdon Tube rating. Having a weatherproof case of die-cast aluminum, the Type 1440 is compact in size (8 inches by 4 inches) with door hinges to left or right and straight line piping.

(This item supplements Black, Sivalls & Bryson Inc. data on pages 657-696 of the Composite Catalog, 20th Edition.)

For more data circle **No. E4** on Readers' Service Card, last page this issue.



Pressure Transformer

The Martin-Decker Corporation has developed the E-80 Sensater, a different kind of pressure transformer for Type "D" and "E" weight indicators. The Sensater slips into the Ideal wire line anchor just like the familiar Type "D" piston. It develops a stroke equal to a piston's travel; it can withstand tremendous pressure; and it is unaffected by temperature and fluid changes. But that's where the similarity ends. The Sensater is a diaphragm-type pressure transformer that works absolutely without friction. Because the Sensater has no piston rod, problems of wear, friction, and piston rod corrosion cannot exist.

The Sensater derives its accuracy and sensitivity from a mobile diaphragm that, through a novel engineering principle, doesn't deflect like ordinary diaphragms, but always moves with its backing plate. Consequently, the area pushing against the hydraulic fluid remains constant, always transmitting direct, no-lag signals to the weight indicator gauge.

The Sensater is designed for years of rugged, trouble-free operation, and to give the ultimate in weight-indicator accuracy.

(This item supplements Martin-Decker Corp. data on pages 3197-3244 of the Composite Catalog, 20th Edition.)

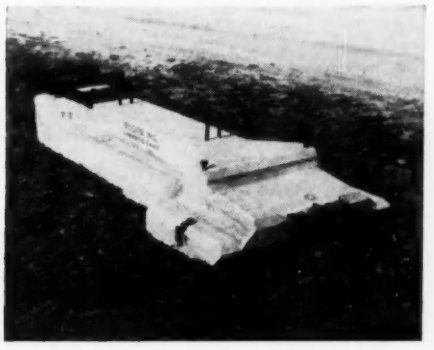
For more data circle **No. E5** on Readers' Service Card, last page this issue.

Well Bore Wiper

The new Pathfinder Well Bore Wiper manufactured by Oil Country Equipment Company, Inc., is designed to remove undesirable materials from the wall of wells so a better bonding of cement can be affected. This tool, by its design, lessens the restriction to the fluid flow in the annulus by use of large wiping loops of 5/32 inch 7 by 7 galvanized aircraft type cable. The high tensile steel of the cable eliminates distortion of wipers as found in other tools for this purpose. There is no excessive abraiding and scratching of the formation.

The 5½ by 4½ loops wipe smoothly and effectively over approximately the entire area to be cleaned on each stroke. This tool can be installed without the use of welding. In combination with the Pathfinder hinged centralizer a 100 percent weldless installation is now available. The wipers come in a type for reciprocation of pipe and a type for rotation of pipe.

For more data circle **No. E6** on Readers' Service Card, last page this issue.



Pump Jack Base

Harry Byers and Sons, Inc., are now manufacturing a portable concrete pump jack base for practically all makes of pump jacks, including National, Jensen, Churchill, Alton, American, Bethlehem and Cabot.

Bases are also available for any make jack on request, up to 12,000 lbs. maximum line pull.

Some of the features of this new base are:

- Pre-stressed reinforcing.
- Portable sled construction.
- Reamed anchor bolts.
- Adjustable steel eye-beam engine supports on all large units.
- Beveled edges and finished surfaces.

For more data circle **No. E7** on Readers' Service Card, last page this issue.

Plug Valves

Two new balanced-type plug valves, the Hamer 10-inch and 12-inch are being manufactured by Hamer Oil Tool Company. Currently being produced in ASA 150-pound and 300-pound classes, the new plug valves are available in carbon steel as well as other materials. Chain wheel attachments for overhead operation are available on both models. Intended for refinery and general service involving high as well as low temperatures, these valves are gland packed. Packings can be changed under pressure while the line is on stream.

The new plug valves can be operated with or without lubricant. They are equipped with lubrication fittings through which an ordinary medium grade of grease may be applied to the packing and bearing surfaces. Valves are so designed that the lubricant fills the balance chambers first; grease will not enter the line unless an excessive amount is applied. Where lubrication is prohibited, these valves will operate effectively with the lubricator hole plugged.

(This item supplements Hamer Oil Tool Company data on pages 2057-2060 of the Composite Catalog, 20th Edition.)

For more data circle **No. E8** on Readers' Service Card, last page this issue.

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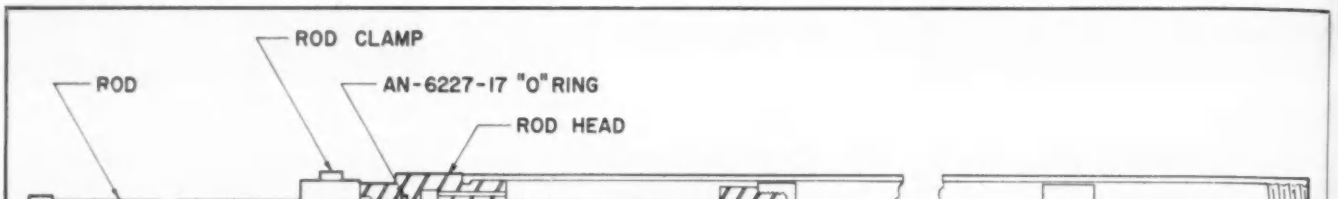


New Test Unit Simplifies Determination of Pump Barrel Wear

Determining the wear on the inside of the barrel of an oil well pump presents a number of difficulties even under the most favorable conditions. In the field, such a determination, particularly in a long-barreled pump, has been practically impossible.

A new device produced by Sargent Engineering Corporation offers a means of determining pump wear in understandable units right in the field or repair shop. It provides the further advantage of being useful in the hands of unskilled operators.

Basically, the slippage tester consists of a means of applying water pressure to the pump barrel against a plunger of standard diameter, and of measuring the actual amount of leakage at 1000 pounds per square inch. Reference to a chart translates the leakage in terms of clearance between the barrel and the piston. Thus it provides an indication of both barrel wear and fluid slippage or loss.

The complete unit consists of various sizes of plunger adapters a rod clamp assembly, chrome-plated rod, a rod head, a graduated measuring device, a hydraulic pressure pump and accumulator, an electric motor, and the necessary electrical connections, pressure hose, gauge, and roller platform for pump and motor.

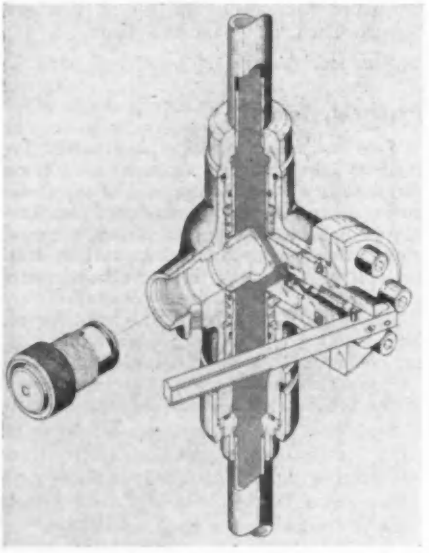
To make the test, the operator makes up the appropriate plunger and plunger adapter on the rod. The plunger is inserted in the pump barrel, which is then attached to the rod head. With the plunger set at any desired point in the barrel, the operator locks it in position with the clamp at the rod head.

Water pressure from the pump at 1000 pounds per square inch is introduced into the barrel through a connection in the rod head. After the leakage at the opposite end of the barrel becomes constant, the volume pouring out in one minute is measured by means of the graduate. The reading can be interpreted in terms of clearance by means of a table.

The whole operation requires no more than ten minutes and can be performed by anyone without special tools.

(This item supplements Sargent Engineering Corporation data on pages 4409-4448 of the Composite Catalog, 20th Edition.)

For more data circle **No. E9** on Readers' Service Card, last page this issue.



Soluble Plug Injector

Kobe, Inc. is producing a new Soluble Plug Injector for use as part of the hydraulic system of pumping oil wells. The new injector permits the insertion of soluble plugs into high pressure oil lines without interrupting oil flow.

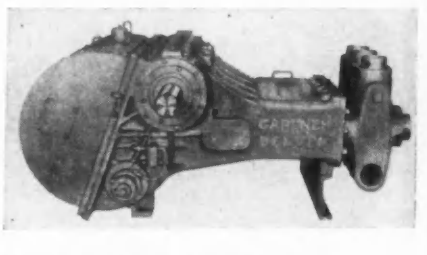
The new injector is applicable for injecting plugs in surface power oil lines at the central power control station. It is also used under the four-way valve of the parallel-type hydraulic free pump system for running soluble plugs down the production (small string) tubing. The injector is available in 1-inch and 1¼-inch sizes and is designed for 5000 pounds per square inch working pressure.

Within the cast steel body is a plug which is square in cross-section. Through this square plug is a large diameter hole which serves as the loading chamber for the soluble plug. In the operating position, the square plug is oriented so the large hole is in line with the flow going through the injector. The square plug itself is held between two spring-loaded shoes which serve to direct flow through the hole. When the square plug is turned 90 degrees (to "load" position) by the external operating handle, there is fluid channel through another hole drilled in the square plug to bypass the loading chamber.

Bumping a bleeder valve in the loading cap, relieves the line pressure within the loading chamber and the cap can be removed. At this time the line fluid flows through the bypass channel. As soon as the soluble plug is inserted in the loading chamber and the cap replaced, the operating handle is turned back to "operate" position. This puts the soluble plug into the flow stream which forces it down the line. Flow through the injector is continuous throughout the operation—it is never interrupted.

(This item supplements Kobe, Inc. data on pages 2673-2692 of the Composite Catalog, 20th Edition.)

For more data circle **No. E10** on Readers' Service Card, last page this issue.



Water-Flooding Pump

A new Triplex plunger pump for water-flooding service at pressures up to 2800 pounds per square inch has been announced by Gardner-Denver Company. Known as the Gardner-Denver Model PA-8, the new pump is rated at 160 horsepower and is said to have a maximum capacity of 263 gallons per minute. The pump is fitted with ceramic plungers and the liquid end is available either in steel or in all bronze. The new pump has been designed throughout with the reserve of strength necessary for continuous operation in the field. It is said to be suitable for well servicing also and for this service it is rated at 160 hp for pressures up to 8000 psi.

(This item supplements Gardner-Denver Company data on pages 1771-1800 of the Composite Catalog, 20th Edition.)

For more data circle **No. E11** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

New Catalogs and Equipment Literature

Compressor Bulletin

Comprehensive engineering details of Cooper-Bessemer's newest engine driven compressor, the GMBA, are presented in a descriptive bulletin just released.

This bulletin, showing the latest Cooper-Bessemer developments in mechanical scavenging of two-cycle engines by rotary blowers, gives performance charts, diagrams and resulting increases in engine power and fuel saving. Cutaway drawings provide complete engine details as well as installation and operational data.

To get a copy, circle **No. E12** on Readers' Service Card, last page this issue.

Welding Book

The latest developments in the science of welding aluminum are described by the Aluminum Company of America in the completely new book, "Welding Alcoa Aluminum."

After an introductory section of this 176-page book explaining characteristics of welded joints, the book describes how to select the best method for welding aluminum. This discussion includes the factors that influence aluminum alloy selection for a welded structure.

Comprehensive descriptions of the methods for aluminum welding are presented in the six chapters that follow. The following welding methods are included in these chapters:

- Inert gas shielded metal arc welding with both tungsten and consumable electrodes.
- Spot and seam welding.
- Flash welding.
- Metal arc, carbon arc, atomic hydrogen and gas welding.

Welding of aluminum castings is explained and is followed by a complete discussion of pressure welding methods and applications. One of the most important contributions of the new welding book is the section on performance of aluminum welds. This discussion offers the readers the extensive experience of Alcoa's research facilities in testing weld performance. In addition, methods are outlined for designing parts with welded joints.

In the final section are 32 comprehensive tables giving data on welding aluminum. These tables include information such as the physical property of aluminum alloys, alloy composition and strength of certain type welds. They also provide useful information about welding conditions.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

Replacement Catalog

Replacement parts for any make or model of drag line bucket are described in a new catalog just released by Electric Steel Foundry Company. This catalog contains information of value to the owner or operator of any make or model of drag line bucket. This 28-page, two-color catalog is indexed and tabbed for speedy reference to parts. Part specifications are presented in groups; for example all of the hoist chain parts are together.

In addition to the catalog section, there is information and hints on such items as how to determine proper drag chain link, drag and hoist chain specifications, and maintenance tips and alloy recommendations. Also included is information of several new products such as the new ESCO "Spring-Lock" hinge repair links for drag chains.

Equipment Catalog

A new 64-page catalog has been published by Ideco describing the company's complete line of oil field drilling, workover and servicing equipment. It is liberally illustrated with full color drawings, detailed specifications and photographs of Ideco Hydrair hoists, power rigs, unitized mobile Rambler rigs and matching auxiliary equipment, including rotary tables, swivels and blocks. In addition to the widely known Full View and Kwik-Lift Masts, two new portable guyless masts are shown. A four-page section describes air-cooled and water-cooled Deutz diesel engines which are distributed throughout the world by Ideco to the petroleum industry.

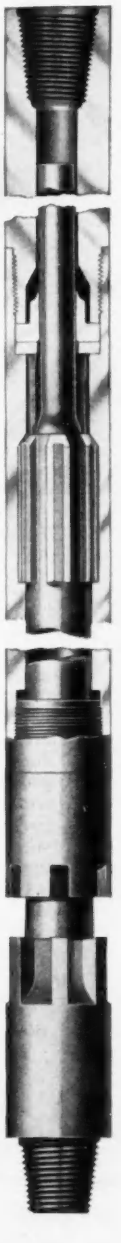
To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Valve Catalog

A new catalog and price list covering the new 2000 psi WP (4000 psi test) as

FOR FAST FISHING TOOL RELEASE
WHEN YOU WANT IT
USE THE BOWEN BUMPER SUB



RELEASING type fishing tools such as spears, sockets, overshots and cutters require downward blows for release of slips or grapples . . . *and the handiest tool you can use to obtain downward blows when fishing with equipment of this type is the Bowen Bumper Sub.*

Operators not only find it a valuable tool for fishing jobs, but in addition use it above the bit or reamer when drilling in sticky formations. The Bumper Sub will jar down by simply dropping or springing the weight of the run-in string the full length of the stroke. Or —to free a bit or reamer—it is instantly ready to jar up by merely taking tension on the string and suddenly releasing it until the Sub is partly open. The rebound of the pipe causes the Sub to strike a hard upward blow. *Moreover, you can alternate upward and downward blows without making any adjustment in the tool from the surface!*

During regular drilling or fishing operations, the Bowen Bumper Sub is an integral part of the string. It easily withstands all the torsional strains of drilling and is packed off with a special abrasive and pressure resistant packing that permits high circulation pressures to be used without leakage. It is amply strong to stand the abuse of drilling and fishing under all conditions, and requires only occasional servicing.

You can use the Bowen Bumper Sub at any desired point in the drilling or fishing string. It is made for use with all standard sizes and types of drill pipe, and in special types which permit free passage of wire line tools, core barrels, etc. *Write Bowen direct for full details!*

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(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

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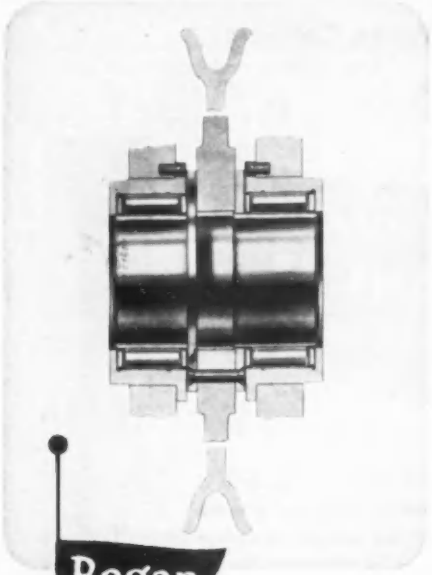
OF THE
PETROLEUM INDUSTRY
Since 1905



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DUAL BEARINGS

. . . for greater bearing life and longer wire line life. With Regan exclusive, rotating inner race Dual Bearings, each sheave has an integral rotating pin which distributes bearing wear around the entire area of the pin. Bearings on *each side* of the rotating pin prevent oscillation of the sheave. This construction permits use of smaller bearings which enables the block to operate at greater speed with less friction and minimum wire line slippage. Exclusive Regan long-lived Dual Bearings are embodied in all Regan Crown and Traveling Blocks.

Write for detailed information.

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Regan

Forge & Engineering Co.

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Exclusive Mid-Continent and Export Distributor:
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General Offices: Fort Worth, Texas

Quality - Wrought on the Forge of Experience

Literature . . .

well as the 3000 psi WP (6000 psi test) mud line valve is now available from Edward Valve, Inc.

This new mud valve is an addition to the Mud Wonder line introduced to the drilling industry in March after doing 21 months testing on rigs in Oklahoma, Texas and Louisiana, A big economy feature in the Mud Wonder line is the interchangeability of parts. Major changes in this new line are lighter bodies and bonnets and a shorter cross arm on the hand wheel. The one-piece seat insert of Buna-N molded integrally to steel wear rings and the hard-chromed gate plus most of the other parts are interchangeable between the 2000 psi and the 3000 psi WP valves.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Separation Equipment Catalogs

Black, Sivalls & Bryson, Inc. announces the publication of three new catalogs covering their Cold-Frac line of low temperature separation equipment. The catalogs are all prepared in non-technical language and arranged for easy use. They include color flow diagrams, installation photos, case histories, and charts and graphs to assist in working out recovery problems. They include complete information on the Cold-Frac line both with and without glycol injection hydrate inhibitor and the econ-o-max, a unit designed for economical low-temperature separation on small gas condensate wells.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Microballon Bulletin

Technical preformance data on Microballon, microscopic spheres made of Bakelite phenolic resin which form the new oil storage evaporation barrier, are available in a 12-page illustrated booklet. Published by Bakelite Company, a Division of Union Carbide & Carbon Corporation, this new booklet describes how one-half inch floating layers of these miscroscopic speres have reduced crude oil evaporation losses by 80 to 90 percent in existing cone-roofing storage tanks.

Results of field and laboratory tests are graphed and tabulated for ready reference. Properties of microballon spheres and the methods of installing them in crude oil storage tanks are also presented in this booklet. Enclosed in the booklet is a packaged sample of these spheres.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Diesel Engines

Lister stationary diesel engines, five models of 9 to 54 bhp. with one to six cylinders are described in a new eight-page illustrated bulletin by The National Supply Company. Design features, specifications and dimensional diagrams are included.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Tripplehorn
PARAFFIN
SCRAPERS

Still the BEST ANSWER to Paraffin in Pumping Wells!

New Improvements:

1. New specially processed, cold-rolled, scale-free steel.
2. Latest heat treating with atmosphere controlled furnaces.
3. New design end forming.

These improvements have resulted in perfect Triple-Spiral Spring-tempered Scrapers.

OTHER ADVANTAGES:

- No Welding — installed at the well.
- SAVES TIME AND MONEY, CAN BE RE-USED on replacement rods.
- May be spaced for any stroke length.
- Will not slip if rod is stressed. Tested for 2350 lbs. grip.
- Now in use in EVERY PARAFFIN AREA.
- Sizes available for IMMEDIATE DELIVERY — TO FIT ⅝" to 1" rods in 2", 2½", and 3" tubing.

Conveniently packaged and easily identified!

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Finest in the field. King Strippers represent outstanding advances in design and construction that assure long life and maximum operating efficiency:

- POSITIVE LATCH will not release by accident or surge of pressure.
- SURE RELEASE MECHANISM operated by rope socket striking bottom of the stripper.
- NON-SPARKING MATERIALS minimize fire hazard.
- ROLLER WIRE LINE GUIDES on hardened steel pins.
- SIDE OPENINGS for inserting packing while line is in the hole.
- PACKING IS SELF-CENTERING; compression screws need not be evenly adjusted.

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KING OIL TOOLS

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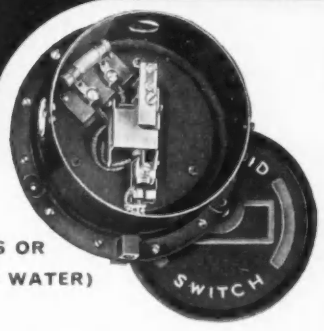
DIFFERENTIAL PRESSURE CONTROLS FOR LOW PRESSURES

MERCURY SWITCH EQUIPPED



FOR AIR OR GAS (INCHES OR FRACTION OF INCHES OF WATER)

TO OPEN OR CLOSE AN ELECTRICAL CIRCUIT ACCORDING TO A MINUTE CHANGE IN THE DIFFERENCE BETWEEN TWO PRESSURES OR VACUUMS

Mercoid Type PPQ Diaphragm Differential Pressure Controls operate from minute changes (.03″ water) in the difference between two pressures.

Ranges to cover most applications (inches of water) 6″ vacuum to 6″ pressure, and 30″ vacuum to 30″ pressure. Available for various circuit arrangements.

Electrical Capacity—0.3Amp. at 115V., A.C. or 0.15 Amp., at 230V., D.C. Can be furnished in explosion-proof or weather-proof cases.

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VISKON

NONWOVEN

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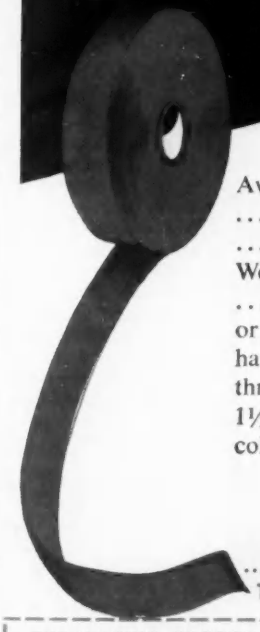

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New Books, Maps and Movies

STONEWALL COUNTY OILMANAC, Compiled and Edited by Frank J. Gardner and William R. Walker, Five Star Oil Report, P. O. Box 331, Houston, 1954. $10 to subscribers; $15 to non-subscribers.

This is the fifth of Five Star's series of reference books on oil and gas resources of the individual counties in Texas. This volume, a development report on the petroleum industry in Stonewall County, Texas, contains many illustrations including structure maps, logs, geologic maps and an insert folded map of the County showing drilling locations, producing oil and gas wells, dry holes, etc.

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NATURAL GAS IN NEW MEXICO, Vicente Trevino Ximenes, New Mexico Studies in Business and Economics, No. 3, Bureau of Business Research, University of New Mexico, Albuquerque, N. M. $1.25.

Natural gas is rapidly gaining in importance as a producer of income and wealth in New Mexico. Despite the stimulus to the state's economy provided by the oil and gas industries, their development has continued the extractive pattern of the state's economy. Relatively little of the state's large production of natural gas is utilized in New Mexico to produce income and wealth for New Mexicans. The fact that the state ships out most of this important industrial resource does raise the problem, "Is New Mexico receiving the benefits it should obtain from these natural resources?"

In this study the author has defined this problem by following the important ramifications of the rapid development of a resource of which much is owned by the public. As a result of his examination, he makes certain recommendations which should be given consideration.

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THE OIL PRODUCING INDUSTRY IN YOUR STATE, Independent Petroleum Association of America, P. O. Box 1019, Tulsa 1, Okla.

A 1954 edition of this statistical reference book on oil and gas production in 27 states has been released. Keyed to the 25th anniversary of IPAA the book features a summary of the growth and development of oil and gas production over the past quarter century. It contains complete statistical sections on each oil and gas producing state and records the growth of the industry in all producing states from the date of first production up to Jan. 1, 1954. In sections on each producing state, the book provides information on the extent and economic value of the industry, production, exploration, development and reserves. Single complimentary copies may be obtained by writing to the above address.

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"A THIRD DIMENSION FOR OIL," Geophoto Services, E. & C. Building, Denver.

A 20-minute, sound color motion picture in 3-D, this film deals with advantages of photogeologic evaluation and has numerous stereo aerial photo views showing examples of geologic structure and stratigraphy with photogeologic annotations; also 3-D ground views of geologic interest. Because special projection equipment and a trained operator are necessary for exhibition, the film is not available for unrestricted loan. However, reservations for exhibition next fall and winter are now being accepted from technical societies and exploration departments of oil companies.

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GEOLOGY OF THE GOLDEN-GREEN MOUNTAIN AREA, JEFFERSON COUNTY, COLORADO, Stanley O. Reichert, Department of Publications, Colorado School of Mines, Golden, Colo. $1.50.

This is the latest edition of the Quarterly of the Colorado School of Mines. Complete with a folder of detailed maps and tables, this volume was originally written as a doctoral thesis by Reichert. The report covers an area of approximately 35 square miles located within the Golden and Morrison quadrangles. It discusses the stratigraphy, geologic structure, geologic history and economic geology of the area.

WELL BASE MAP OF WHARTON COUNTY, TEXAS, Macha Drafting Company, 4837 Gulf Freeway, Houston, Texas.

This map is the first of a series of county well base maps to be constructed by Macha Drafting Company for the Upper Gulf Coast area of Texas. The map shows USC and GS monuments with their intermediate distances shown in a network of quadrilaterals to insure accuracy throughout the county and to eliminate possible accumulated error in scale from one area of the map to another. Horizontal control from the Texas Coordinate System as prepared by the USGS was used in mapping the county. This map includes an intergradation of all available source material in the form of records, survey information and planimetric base sheets prepared by State and U. S. Government agencies.

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ELECTRIC LOG CROSS SECTION (D-D', 1954), North Dakota Geological Society, P. O. Box 1123, Bismarck, N. D. $12.50.

A correlated "Electric Log Cross-Section (D-D', 1954)" extending from southeast Saskatchewan, Canada, through western North Dakota to the northern Black Hills in South Dakota. The cross section includes fifteen electric logs and a Black Hills outcrop section. Electric logs from wells in the Beaver Lodge, Tioga and Fryburg Pools in North Dakota are included in the section.

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